JUNE 27, 1955

Electrical World

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A McGRAW-HILL PUBLICATION

Harllee Branch, President of Edison Electric Institute and Georgia Power Co.

An exclusive interview

See Page 86

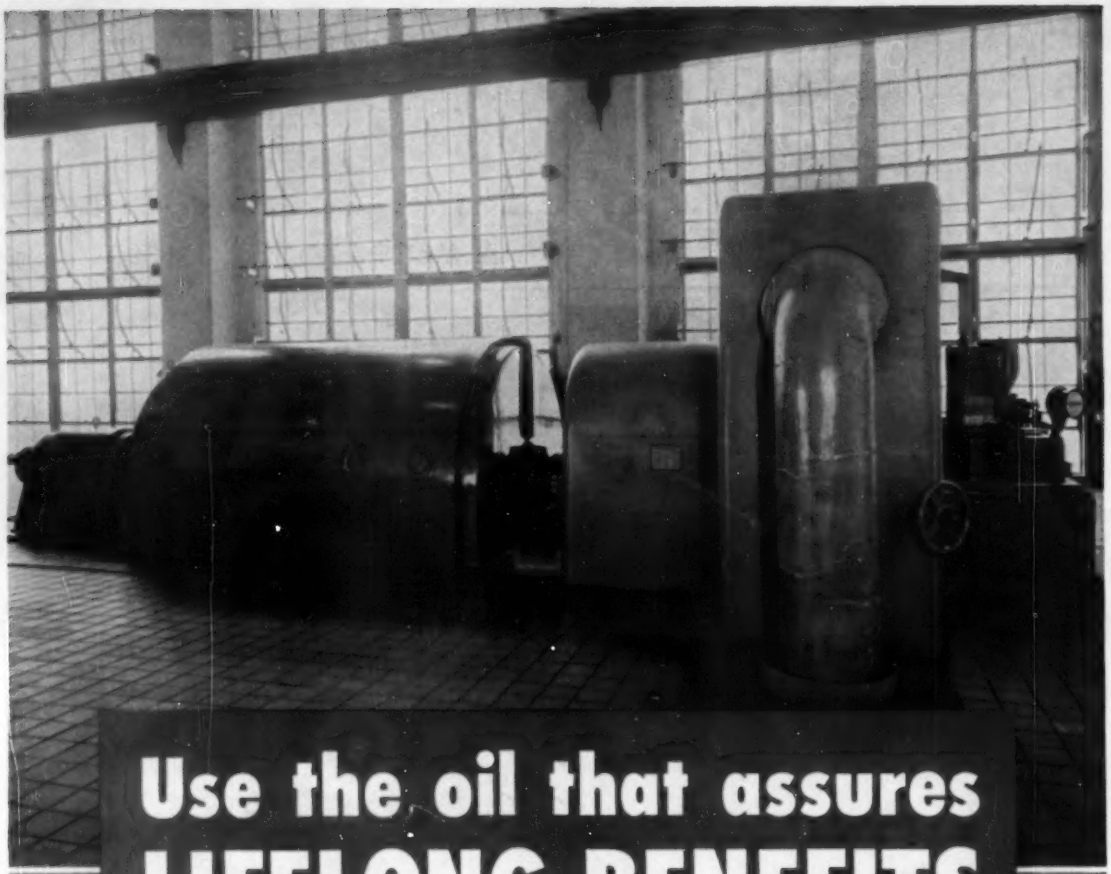
Adequate Wiring — Where Is It Going?

A special survey report

See Page 107

SALES AND SERVICE

See Page 168



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Electrical World

Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol 143 No. 26 June 27, 1955

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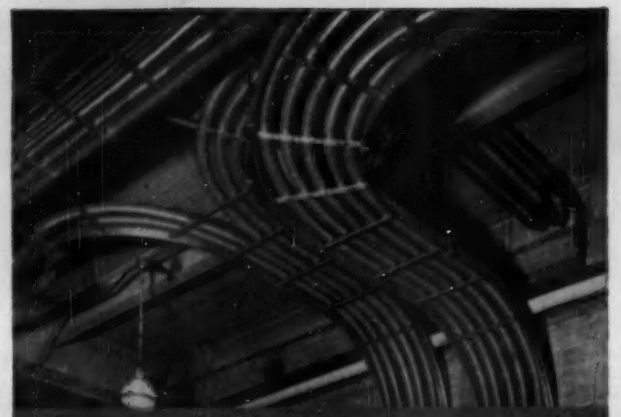

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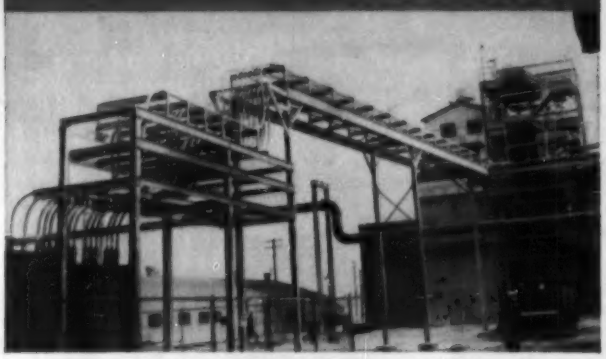
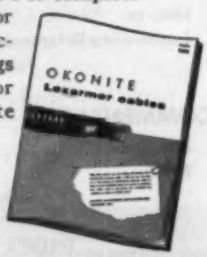


rubber-insulated LOXARMOR CABLES save space, reduce cost

Considerable interest is growing throughout industry in Loxarmor (interlocked armor) Cables for use in locations where the maximum protection of a rigid conduit is not required. Okonite's interlocking Loxarmor covering makes the cable flexible and easy to train (minimum bending radius 8 times cable O.D.) and at the same time provides mechanical sturdiness. Installation costs are lower than for rigid conduit systems, and Loxarmor's accessibility makes it easier and cheaper to reroute or add circuits. Its compactness provides important space-saving features where runs must be installed around existing plant equipment. Loxarmor coverings can be supplied in galvanized steel, aluminum, bronze or copper.

Okonite rubber-insulated Loxarmor Cables are insulated with Okonex, a butyl-base compound applied by Okonite's famous strip-insulating process. Vulcanized in a metal mold, the insulation forms a solid dielectric wall which has better moisture resistance and electrical properties than laminated varnished cambric insulations. The superiority of Okonex is indicated by its higher insulation resistance, lower dielectric loss, lower power factor and lower specific inductive capacity.

Okonex-insulated Loxarmor Cables are suitable for operation up to 15,000-volts and at conductor temperatures up to 85C. For complete information on Okonite Loxarmor Cables, including detailed splicing and terminating drawings and instructions, write for Bulletin EW-1090. The Okonite Company, Passaic, N. J.



Available with either copper or aluminum conductors

OKONITE *insulated cables*

2976

Ahead

...in Styling!...in Performance!

New RCA Carfone ONE / FIFTY 2-Way Radio

Performance-wise, as well as appearance-wise, this is the finest 2-way radio equipment that RCA has ever offered. Engineered for top performance, clearest voice reception, minimum maintenance and low-cost servicing, its features represent planning that is years ahead.

Among the built-in advantages you'll welcome now and benefit from in the years to come . . .

IN THE DESK STATION

- Styled for convenience
- Best frequency stability, without ovens
- Rainbow Tuning—color directed, all top adjustments
- Dual frequency operation, if needed
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IN THE MOBILE UNIT

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Please send me information on the new RCA Carfone "150" 2-Way Radio.

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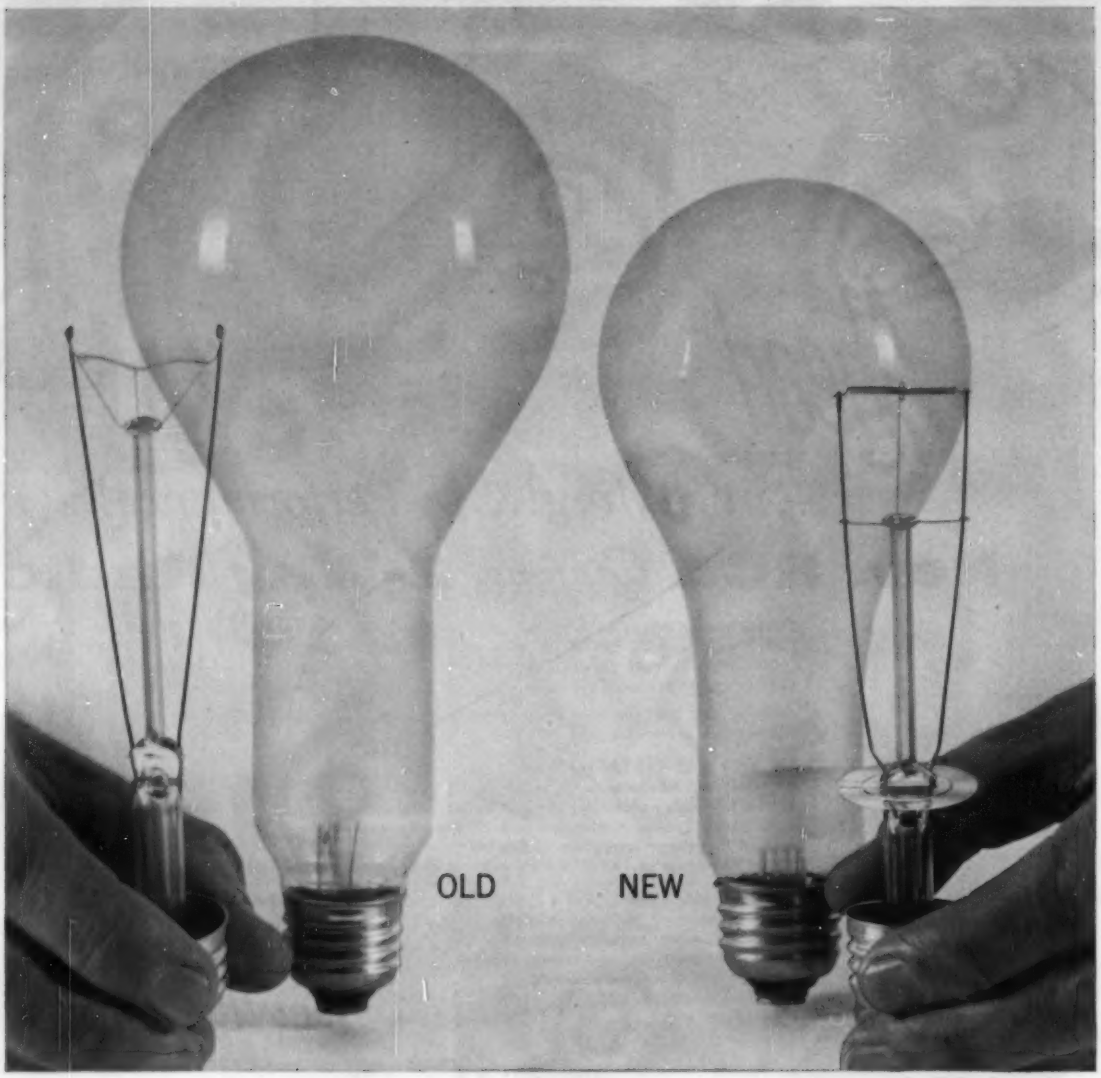
G-E LAMPS GIVE YOU MORE FOR ALL YOUR LIGHTING DOLLARS



New General Electric 200-watt bulb takes less space, but gives more light

A NEW General Electric 200-watt bulb, shorter and slimmer than the old one, fits into fixtures and lamps that would formerly take nothing larger than a 150-watt bulb.

The new G-E bulb gives about 3% more light than the old one. In the new bulb, the filament is an efficient *coiled* coil, which needs only one support. The filament of the old bulb is a single coil which needs three fine-wire supports. Although these support the filament firmly, they tend to cool it and slightly reduce the light. Based on average operating costs, the extra light of the new bulb is worth 7¢ to 10¢ over the life of the bulb.

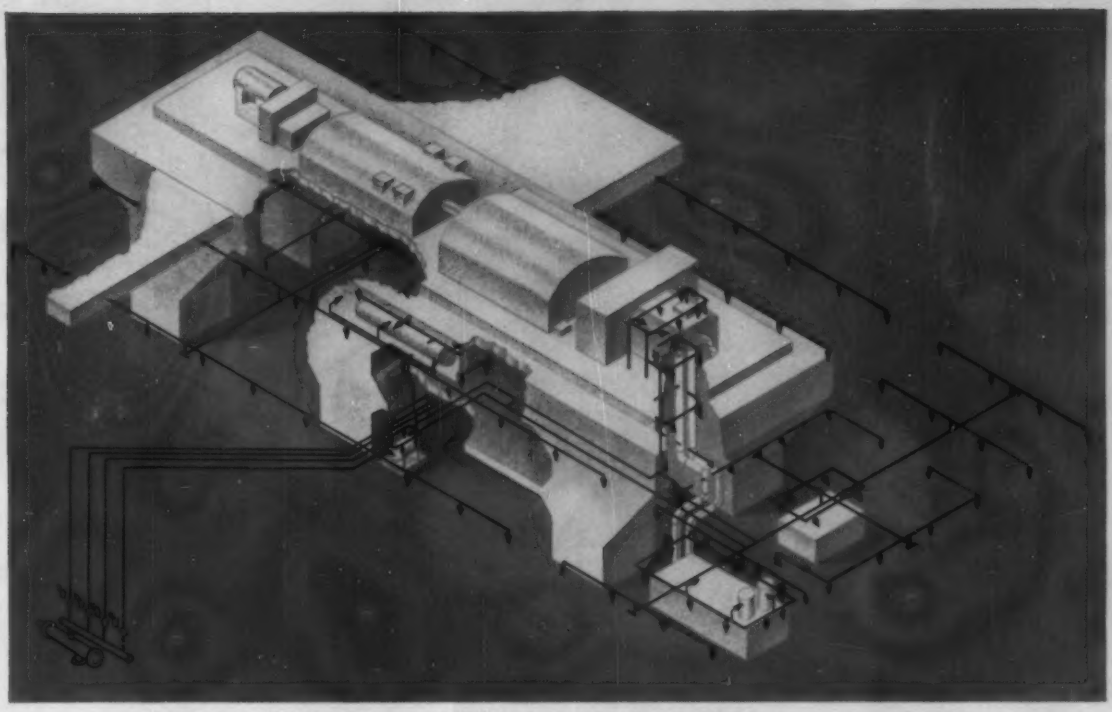
Though the new design puts the hot filament closer to the base, the new General Electric 200-watt bulb is safe to use even in paper-lined sockets. That's because of a heat-reflecting disc of aluminum between the base and the filament.

With all this extra value built in, the new bulbs list at a penny *less* than the old. For more facts on how General Electric gives you more for *all* your lighting dollars, write for a 16-page G-E progress report to lamp users. It's free, just write General Electric Company, Dept. 482-EW-6, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Complete Fire Protection for Turbine Oil Systems



Typical Turbine Oil Mulsifyre System, sectionalized and actuated either automatically or by remote manual control

The severity of turbine oil fires of recent years, and the heavy losses resulting from them, have proved the need for an efficient protection system throughout the *whole* area of hazard. One of the most practical extinguishing agents for putting out oil fires is water spray — and, one of the most effective methods of producing water spray is a Grinnell Mulsifyre System.

Grinnell Mulsifyre attacks oil fires in these different ways:

- By forming a fire-extinguishing blanket of emulsion on the surface of the oil.
- By introducing water vapor molecules between the oil vapor and oxygen molecules, to make the resulting mixture unburnable through "vapor dilution".
- By cooling oil at its surface, thus slowing down production of burnable vapor.
- By using up heat through flash evaporation of water, to keep oil vapor below the ignition point.

Grinnell manufacturers and installs fire protection systems for every normal or special fire hazard — Grinnell Automatic Sprinkler Systems for standard risks; Grinnell Mulsifyre, ProtectoSpray, Multitrol Deluge, ProtectoFoam, C-O-Two, and dry chemical systems for special or extra-hazardous risks. Write for your free copy of "Occupancy Fire Record in Electric Generating Stations" and "Turbine Oil Fire Protection". Grinnell Company, Inc., Providence, R. I. Branch Offices in principal cities.

GRINNELL *Mulsifyre*

EMULSION EXTINGUISHMENT OF OIL FIRES

"Maintenance needs Megger Testers
. . . as Surgery needs the X-ray"
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Insulation Resistance Tester
Megger
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JAMES G. BIDDLE CO.

Biddle*

* The word "MEGGER" is a registered trademark. There is only ONE "MEGGER" family of electrical resistance measuring instruments . . . and in the U.S.A., the words "BIDDLE" and "MEGGER" have been synonymous with electrical resistance testing since the beginning of the century.

*Megger**

INSULATION RESISTANCE TESTERS

Standard the World Over

One of the outstanding merits of all types of Megger instruments is quality of a high order. The performance and endurance records which these instruments have achieved are difficult, if not impossible, to match in any type of portable testing device. For insulation resistance measurements, Megger instruments are *the recognized standard.*

AN INTEGRAL PART OF ELECTRICAL OPERATIONS EVERYWHERE

Throughout industry Megger Instruments have earned the distinction of being the most widely accepted devices for making electrical resistance measurements. They are the universally accepted instruments for preventive maintenance programs and the regular maintenance of electrical equipment. By their periodic use, and from the records of their measurements of the insulation in all important equipment, trouble may be anticipated and avoided, and production stoppages and losses reduced.

BIDDLE PRACTICAL TECHNICAL ASSISTANCE HELPS MAKE PRODUCTIVE MAINTENANCE POSSIBLE

Over forty years of experience in the field of electrical testing is represented in the manuals, bulletins, and other technical literature published by the Biddle Company. These are some of the extras you get with your purchase of a Megger Instrument. Practical engineering assistance is always available without obligation.

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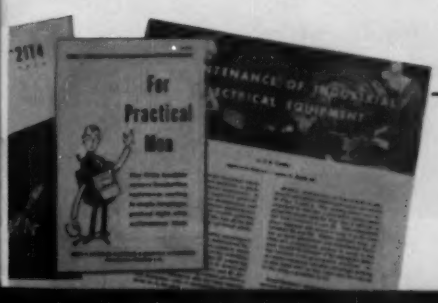
A complete file has been prepared for your reference in setting up and interpreting a practical electrical testing program. Included is the 100-page Megger Insulation Testing Manual . . . a valuable addition to any electrical man's library. Check the coupon or write for File 21



James G. Biddle Co.

Established 1895

Electrical & Scientific Instruments

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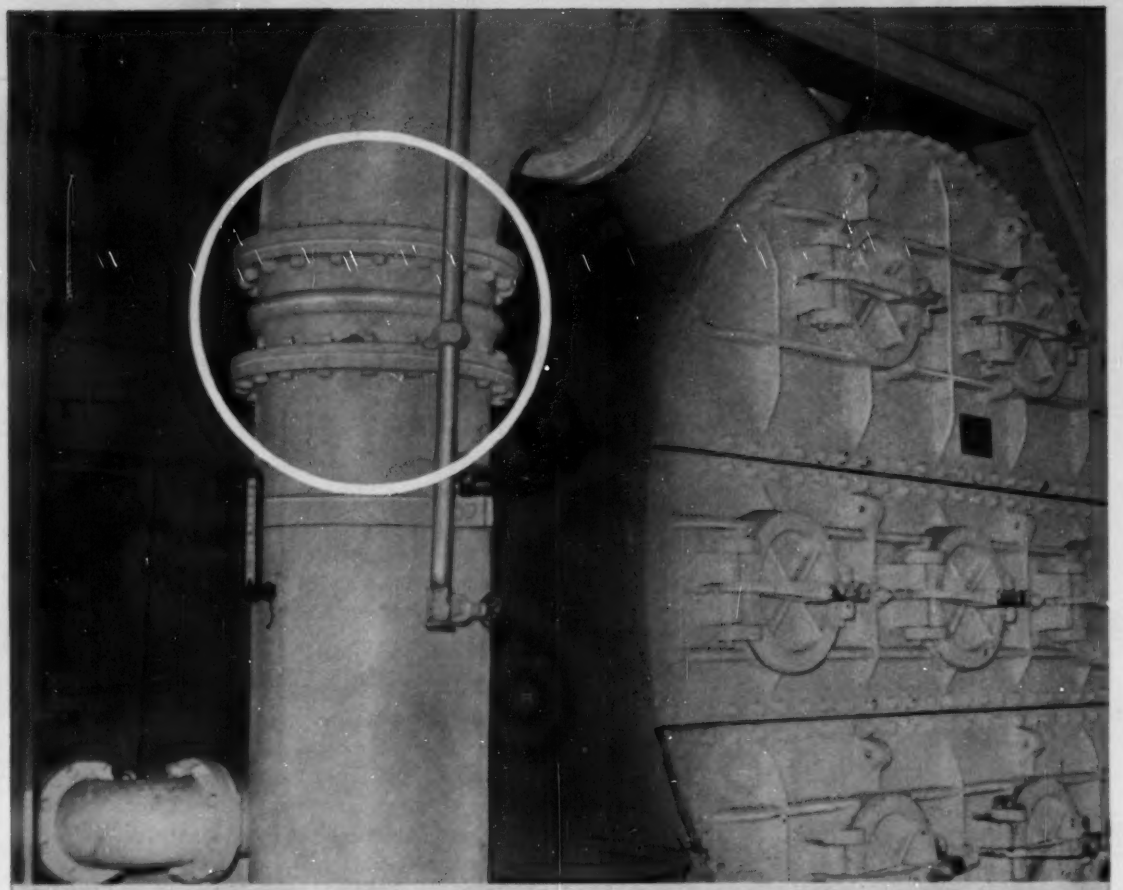

30-YEAR SERVICE RECORD CHALKED UP BY U. S. EXPANSION JOINTS IN WEST COAST POWER PLANT

Above is one of 12 U.S. Expansion Joints installed 30 years ago in a California utility plant. Despite their age these joints are still functioning.

U.S. Rubber Expansion Joints are economical, flexible connections used in pipe lines to take up the stresses due to vibration, expansion and contraction. They prevent the transmission of noise, and take care of misalignment. They have no moving parts to wear or bind and thereby shorten service life.

U.S. Rubber Expansion Joints can be installed on both new and old piping and equipment. These joints plus engineering service are available through any of our 27 "U.S." District Sales Offices, or write address below.

"U.S." Research perfects it...
"U.S." Production builds it...
U.S. Industry depends on it.

US RUBBER

UNITED STATES RUBBER COMPANY
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Hose · Belting · Expansion Joints · Rubber-to-metal Products · Oil Field Specialties · Plastic Pipe and Fittings · Grinding Wheels · Packings · Tapes · Molded and Extruded Rubber and Plastic Products · Protective Linings and Coatings · Cushioning Rubber · Adhesives · Soil Coverings · Mats and Matting

JOSLYN CLUSTER TRANSFORMER MOUNTS

Provide Greater Flexibility of Mounting
Plus Ease of Installation
Plus High Strength to Insure Adequate Safety Factor

For Poles 8" to 18" in diameter

For 12" & 24" Lug Spacings

For Transformers rated 3 to 100 kva

PATENT APPLIED FOR

ORDERING INFORMATION

Part No.	Range of Pole Sizes	Range of Transformers (Same Accommodated)
J6793	8" to 12"	Any combination of 3 Transformers Rated 3 kva to 100 kva
J6794	12" to 14"	
J6795	14" to 18"	

A one-piece mounting yoke and adjustable pole-band construction makes the Joslyn Cluster Mount the easiest to install.

Strong enough to support loads in excess of four tons.

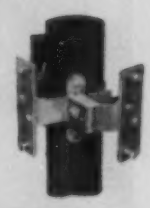
* Three Adapter Plates cover all types of transformer mounting arrangements and should be separately ordered.

Joslyn Cluster Mounts are REA approved (Item D 6a)

25 kva to 50 kva
24" Lug Spacing

3 kva to 50 kva
12" and 24" Lug Spacing

75 kva and 100 kva
24" Lug Spacing



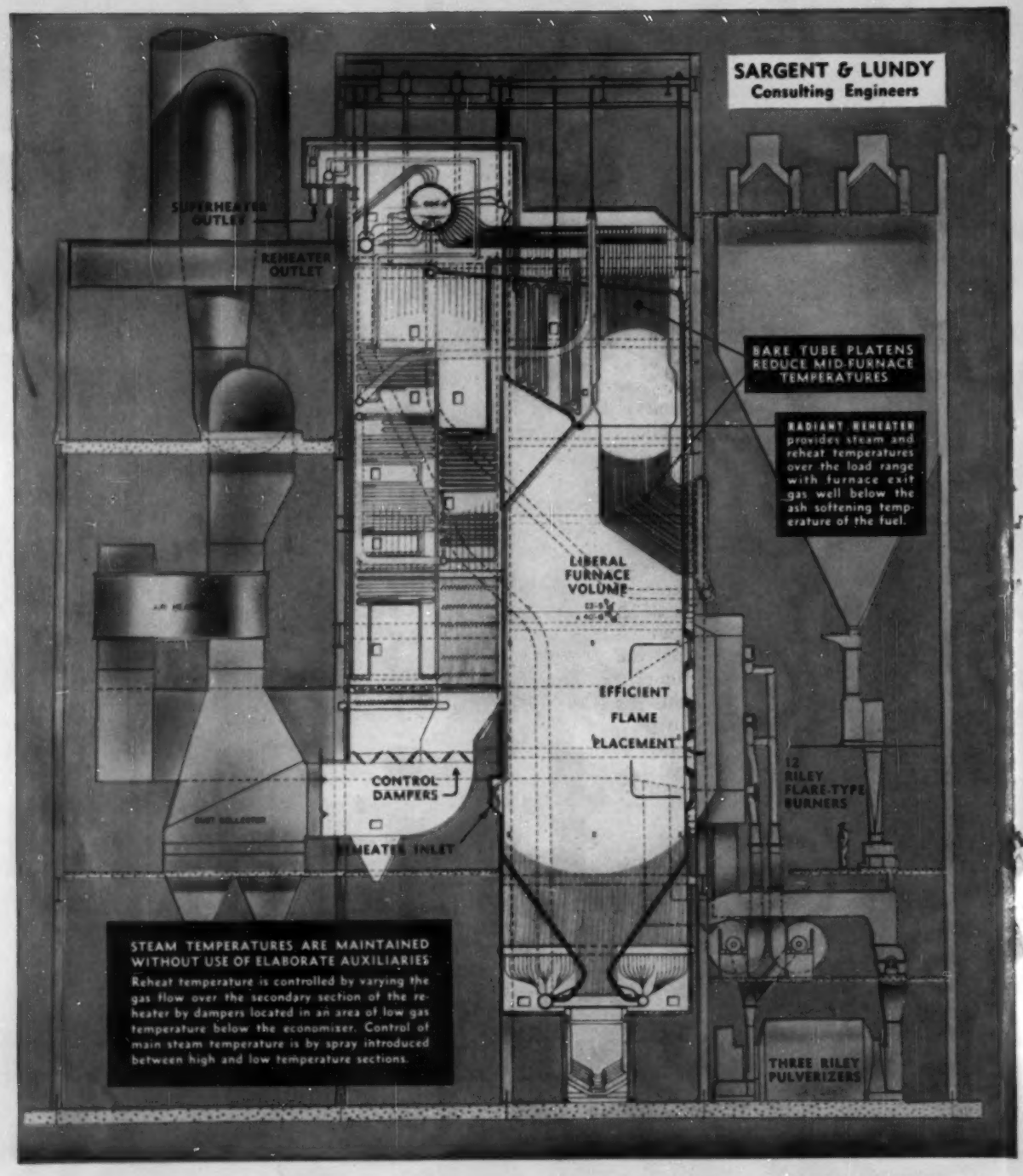
3 kva to 15 kva
12" Lug Spacing

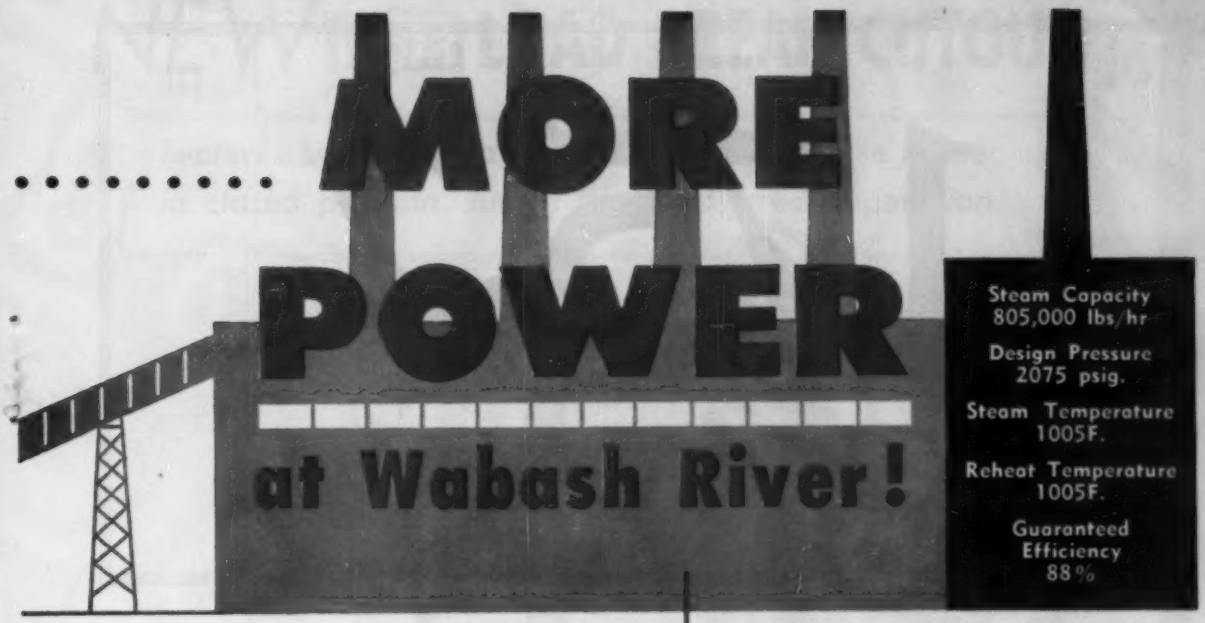
JOSLYN Mfg. and Supply Co.

20 North Wacker Drive, Chicago 6, Ill.

Public Service Company of Indiana, Inc.

selects this RILEY reheat unit for . . . .


SARGENT & LUNDY
Consulting Engineers
SUPERHEATER OUTLET
REHEATER OUTLET
BARE TUBE PLATENS REDUCE MID-FURNACE TEMPERATURES
RADIANT REHEATER provides steam and reheat temperatures over the load range with furnace exit gas well below the ash softening temperature of the fuel.
LIBERAL FURNACE VOLUME
EFFICIENT FLAME PLACEMENT
CONTROL DAMPERS
12 RILEY FLARE-TYPE BURNERS
THREE RILEY PULVERIZERS
STEAM TEMPERATURES ARE MAINTAINED WITHOUT USE OF ELABORATE AUXILIARIES
Reheat temperature is controlled by varying the gas flow over the secondary section of the reheater by dampers located in an area of low gas temperature below the economizer. Control of main steam temperature is by spray introduced between high and low temperature sections.



Typical of the trend to more efficient and economical steam generating units is the Riley reheat unit recently purchased by Public Service Company of Indiana, Inc. This unit, the fifth and largest to be installed at the new Wabash River station is designed *specifically* to burn *successfully* poor grades of Indiana coal.

Design features that make this performance possible are: liberal furnace volume, adequate furnace cooling, bare tube platens to reduce mid-furnace temperatures, efficient flame placement, the use of radiant reheat surface and a combination of damper and spray steam temperature control.

The acceptance of Riley units by Public Service Company of Indiana, Inc. (this is its eighth Riley unit) . . . and by a steadily increasing number of other leading public utilities is due to design characteristics such as featured by this unit, high yearly net efficiency, dependability and continuity of operation.

The ninth and tenth Riley units have recently been ordered by Public Service Company of Indiana, Inc. Two 1,000,000 lbs/hr. Riley Reheat Units with 2075 design pressure and a 1005 F reheat-superheat temperature will provide steam for New Albany Station at New Albany, Indiana. Let your Riley sales engineer tell you about them and other Riley reheat designs.

Public Service Co. of Indiana, Inc. is one of many important public utilities that in recent years have ordered Riley Reheat Units . . .

Utah Power & Light Company
Gadsby Station
1-575,000 lbs/hr; 1700 psig; 1000/1000F.

Louisiana Power & Light Company
Nine Mile Point Station
1-1,000,000 lbs/hr; 1725 psig; 1005/1005F.

City of Los Angeles, Dept. of Water & Power, Valley Steam Plant
2-1,200,000 lbs/hr; 2075 psig; 1000/1000F.

Houston Lighting & Power Company
Deepwater Station and Sam Barton Steam-Electric Station each
1-1,200,000 lbs/hr; 2125 psig; 1005/1005F.

Texas Electric Service Co.
Fort Worth
1-1,250,000 lbs/hr; 2125 psig; 1005/1005F.

Central Louisiana Electric Company, Inc.
Teche Station
1-350,000 lbs/hr; 1050 psig; 1005/1005F.

Florida Power Corp.
Suwannee River Plant
1-600,000 lbs/hr; 1550 psig; 1000F/1000F.

Dairyland Power Cooperative
Alma, Wisconsin
1-390,000 lbs/hr; 1650 psig; 1005/1005F.

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY
Stoker Corporation
WORCESTER, MASSACHUSETTS

Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

Complete Steam Generating Units and Fuel Burning Equipment for Public Utility and Industrial Power and Heating Plants

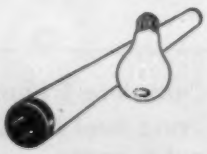
175.2
EXTRA KWH

Westinghouse Announces A New Load-Builder For Every Home On Your Lines

If you are looking for a residential load-builder which is low in cost, high in earned revenue, and can be sold in large quantities . . . cheaply, easily, and quickly . . . Westinghouse now has the answer. It is more than an electrical gadget. It is a device which meets a genuine and heretofore unfilled need in every home. And, it provides continuous off-peak use, new use in low-load areas.

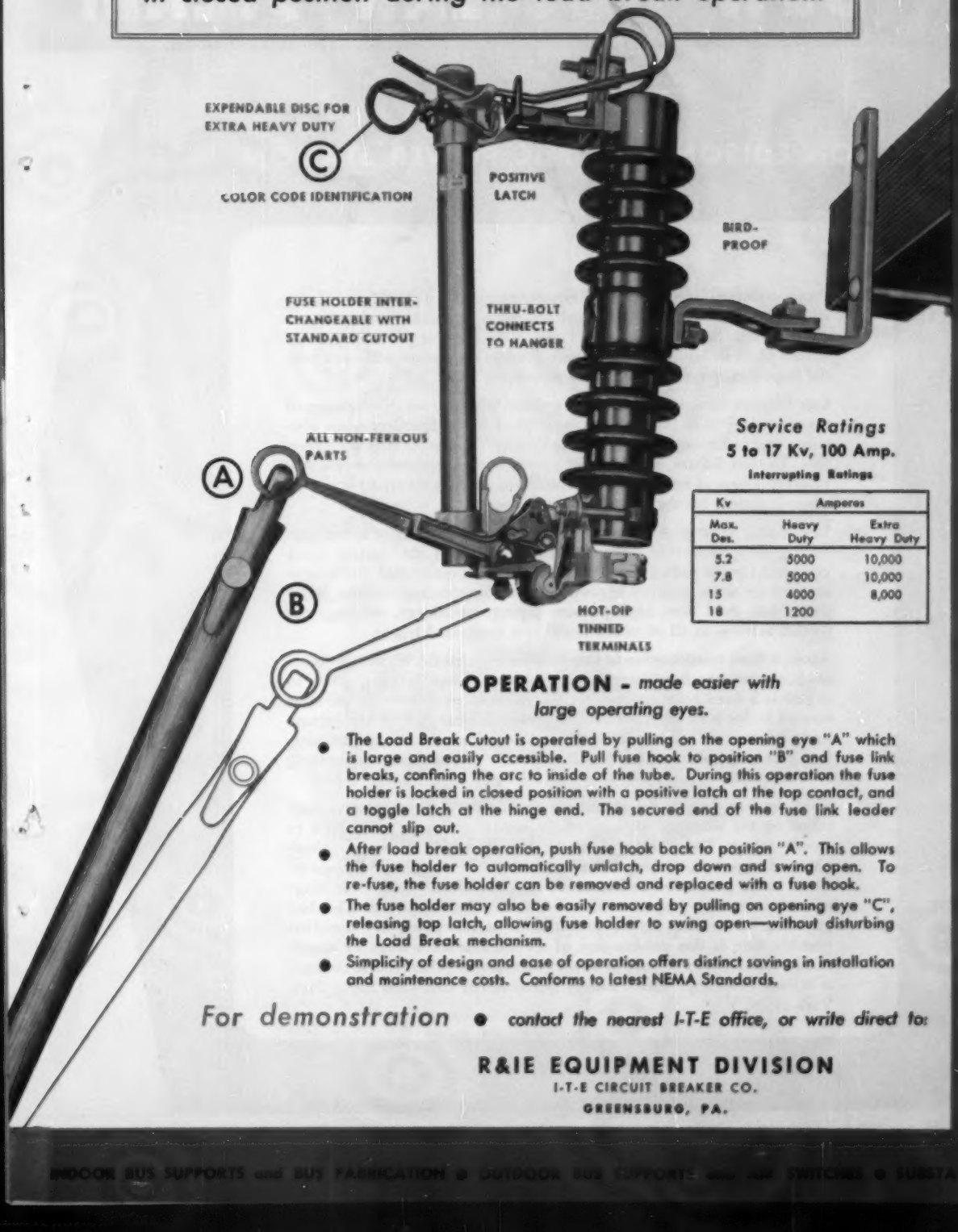
It's no secret, but words alone cannot do justice to the potential of this new load-builder. We'd like to have a Westinghouse representative actually demonstrate it to you. Write Headquarters Sales, Westinghouse Electric Corporation, Lamp Division, Bloomfield, N. J.

YOU CAN BE SURE...IF IT'S **Westinghouse**



NEW R&IE LOAD BREAK CUTOUT

Features **LOCK-IN safety feature** *to lock fuse holder in closed position during the load break operation.*



Service Ratings

5 to 17 Kv, 100 Amp.

Interrupting Ratings

Kv	Amperes	
Max. Des.	Heavy Duty	Extra Heavy Duty
5.2	5000	10,000
7.8	5000	10,000
15	4000	8,000
18	1200	

OPERATION - *made easier with large operating eyes.*

- The Load Break Cutout is operated by pulling on the opening eye "A" which is large and easily accessible. Pull fuse hook to position "B" and fuse link breaks, confining the arc to inside of the tube. During this operation the fuse holder is locked in closed position with a positive latch at the top contact, and a toggle latch at the hinge end. The secured end of the fuse link leader cannot slip out.
- After load break operation, push fuse hook back to position "A". This allows the fuse holder to automatically unlatch, drop down and swing open. To re-fuse, the fuse holder can be removed and replaced with a fuse hook.
- The fuse holder may also be easily removed by pulling on opening eye "C", releasing top latch, allowing fuse holder to swing open—without disturbing the Load Break mechanism.
- Simplicity of design and ease of operation offers distinct savings in installation and maintenance costs. Conforms to latest NEMA Standards.

For demonstration ● *contact the nearest I-T-E office, or write direct to:*

R&IE EQUIPMENT DIVISION

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STRUCTURES—steel or aluminum ● TESTING DEVICES ● BUS BARS AND INTERLOCK SYSTEMS ● ISOLATED PHASE BUS STRUCTURES ● INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION ● OUTDOOR BUS SUPPORTS and BUS SWITCHES ● SUBSTATION

B&W NUCLEAR STEAM

Selected for

CON EDISON'S ATOMIC POWER STATION

Progress toward large-scale use of atomic energy took a giant forward step with Consolidated Edison Company's decision to build a nuclear steam-electric generating plant at Indian Point, N.Y. The first privately financed atomic plant in history, Con Edison's 250,000 kw station will rank with the largest conventional fuel plants now being built.

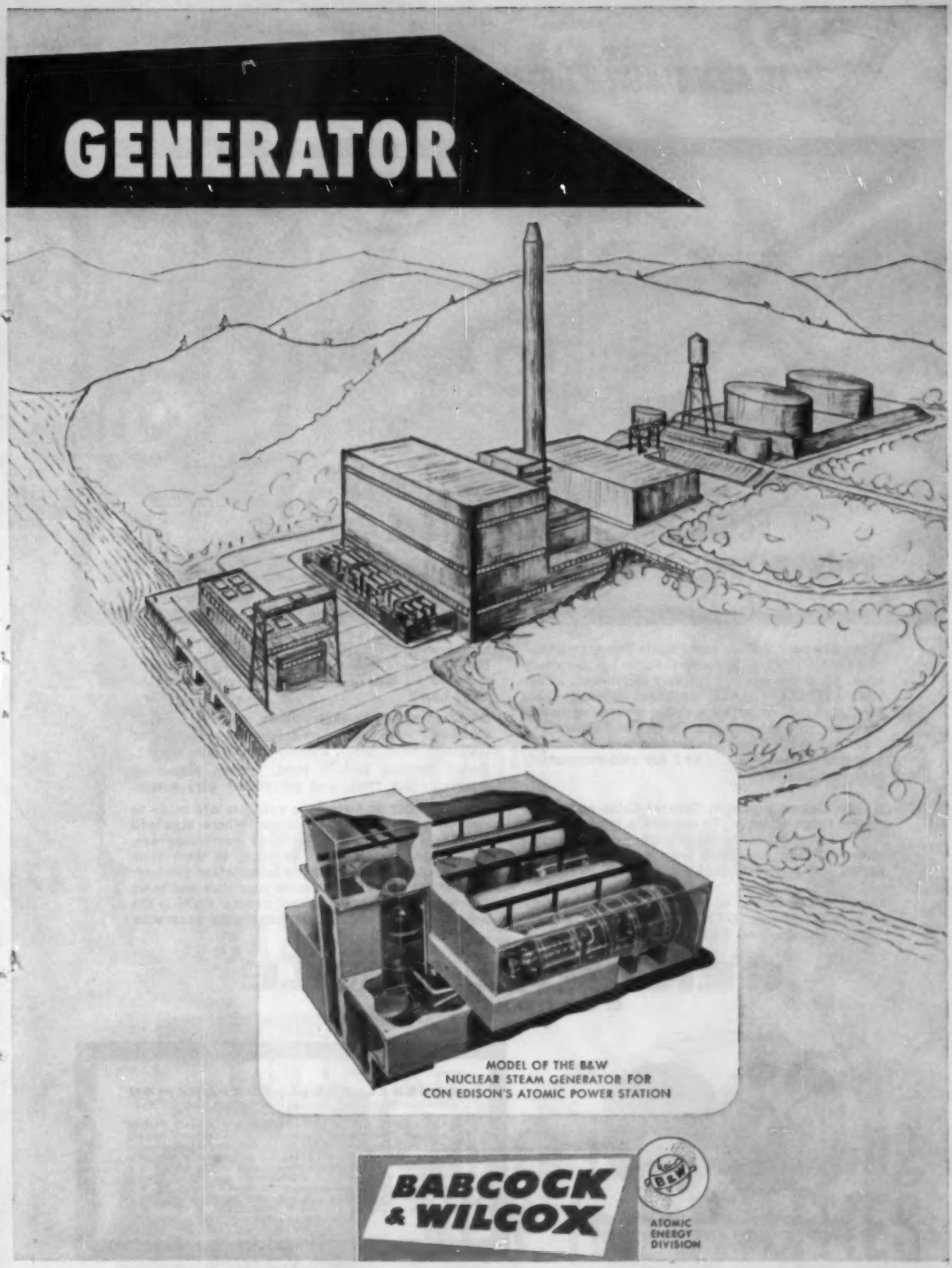
Con Edison's farsightedness in going ahead with private development of atomic energy is in the tradition established by its founders when electricity was first brought to New York City by Thomas A. Edison 73 years ago. To Con Edison, as to B&W, atomic fission represents a new and valuable source of heat — to be harnessed to develop electricity in a safe, efficient manner for the benefit of its customers.

In selecting Babcock & Wilcox — an experienced supplier of steam generating equipment — to design, fabricate and erect the nuclear steam generator for the Indian Point plant, Con Edison recognized that a large share of the skills involved in nuclear power concern heat transfer, steam generation, fluid flow, high pressure piping, metallurgy, welding, and similar fields — in all of which B&W is a recognized leader.

Another basic consideration in this decision was that B&W, with its thousands of man-months of experience in nuclear power, is in a position to negotiate a fixed price contract for the required equipment, in the same manner as for a steam generator using conventional fuel. When its new fuel element fabrication plant now under construction near Lynchburg, Va., goes into operation, B&W will be capable of fabricating almost 90% of this equipment in its own shops.

Since the first days of the Manhattan Project B&W's experts have been called on for solutions to many of the special problems which arise in atomic energy. Today, more than 100 experienced B&W nuclear physicists and engineers, working in concert with B&W's large staff in conventional steam generation and its allied arts, are directing the wide range of atomic energy projects which B&W has been awarded. The best guarantee of realizing the full potentials of nuclear power at the earliest possible date is this combination of an intimate knowledge of atomic energy with nearly a century of steam generating experience. The Babcock & Wilcox Company, Atomic Energy Division, 161 East 42nd Street, New York 17, N. Y.

GENERATOR



MODEL OF THE B&W
NUCLEAR STEAM GENERATOR FOR
CON EDISON'S ATOMIC POWER STATION

BABCOCK & WILCOX

ATOMIC
ENERGY
DIVISION

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

RUBBER and PLASTIC POWER and CONTROL CABLES

When you need Rubber and Plastic Power and Control Cables . . . look to General Cable . . . for every type, for every use . . . for fast deliveries . . . for UNMATCHED QUALITY! These General Cable products have earned an enviable reputation among users for transmission, distribution and control . . . for direct earth burial . . . for duct and conduit . . . for submarine use . . . and for self-supporting aerial applications.

As the biggest producer, General Cable makes the widest range of types. To mention a few: network, high voltage, supervisory and station control, series street lighting, pole and bracket, self-supporting aerial, and generator lead cables.

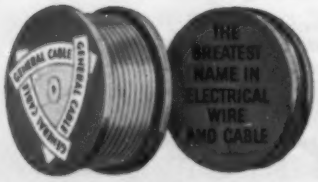
Constructions consist of copper and aluminum conductors. Insulations: GENCASEAL (Thermoplastic Vinyl), polyethylene, THERMAX W (moisture and heat resistant), AQUASEAL (heat and moisture resistant—low SIC), GENCORONE (ozone-resistant oil base), BUTARONE (ozone-resistant butyl base).

Outer coverings include rubber, neoprene, GENCASEAL, lead, reinforced neoprene over lead, and textiles (cotton, glass, asbestos, sisal, jute, rayon).

Armor finishes include steel, bronze, aluminum interlock; flat steel, and galvanized wire armor.

These popular and versatile products are made to meet *every* operating condition. Where standard types are not suitable for your particular use, special constructions will be made to meet your exact needs. Get the complete facts before you buy. Let our engineers help to solve your wire and cable problems. And, remember, that General Cable is the *only* manufacturer who can supply *all* your wire and cable needs!

GENERAL CABLE
CORPORATION

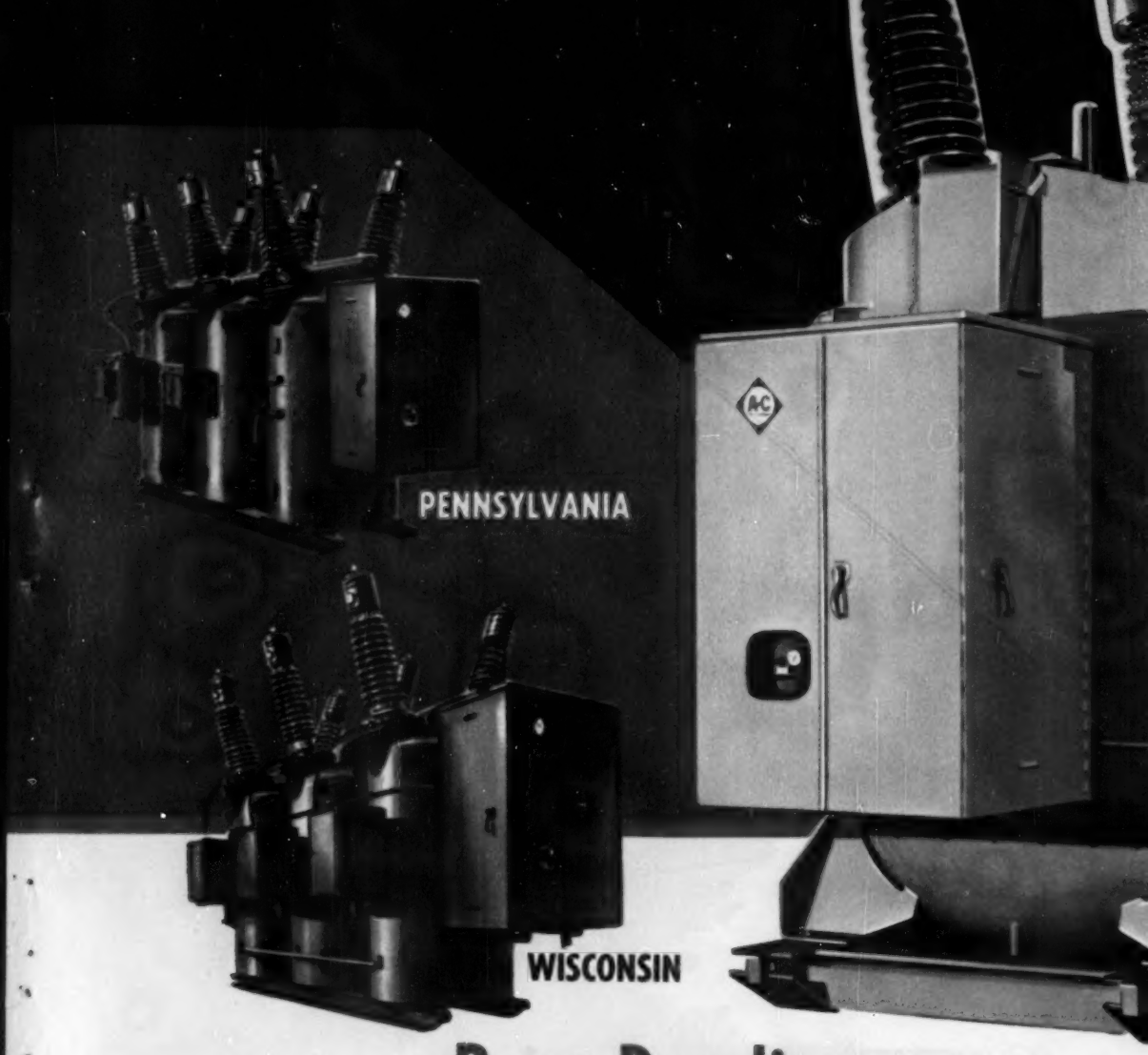


BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

GENERAL CABLE CORPORATION
Executive Offices: 420 Lexington Ave., New York 17, N. Y.

SALES OFFICES: Atlanta • Baltimore • Boston • Buffalo Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit Erie (Pa.) • Greensboro (N. C.) • Houston • Indianapolis Kansas City • Lincoln (Neb.) • Los Angeles • Memphis Milwaukee • Minneapolis • New Haven • Newark (N. J.) New York • Philadelphia • Pittsburgh • Portland (Ore.) Richmond (Va.) • Rochester (N. Y.) • Rome (N. Y.) St. Louis • San Francisco • Seattle • Springfield (Ill.) Syracuse • Tampa • Tulsa • Washington, D. C.

From
Oregon to New York
Texas to Wisconsin...
See inside
There is Something
NEW for UTILITIES
A-4657



Pneu-Draulic
Circuit Breakers are

"Showing U

ALLIS-CHA

...up" all Over!

. . . and the big breaker above is one of the latest. It's the world's largest hydraulically operated breaker. *Here are a few facts about it.*

- Rating — 230 kv, 10,000,000-kva interrupting capacity.
- Operating mechanism — fast, simple *Pneu-Draulic* operator.
- Interrupting device — *Turbo Jet* interrupter for fast interruption on both high current faults and low current switching.
- Mechanically trip-free — to allow contacts to open at full rated speed under *all* operating conditions.

Pneu-Draulic and Turbo Jet are Allis-Chalmers trademarks.

ALLIS-CHALMERS

...See back page for reasons why it's the best

Why the Pneu-Draulic Operator is the best in any area!

1. Simple — Has fewer parts than other types of operating mechanisms.

2. Unaffected by Temperature — Whether it's hot or cold, the energy stored in the system provides more than standard number of operations. Use of oil with constant viscosity over wide range of temperatures insures uniform performance.

3. Eliminates Moisture and Corrosion Problems — Entire system is filled with oil containing inhibitor which eliminates rust, freezing and corrosion.

4. No Dust Problem — Offers the protection of a sealed system. Efficient filtering eliminates dust and dirt problems.

5. Fast — Can be set to release faster than any present standard.

6. Emergency Closing—Can be closed at full speed onto energized line even when no control power is available.

7. Mechanically Trip-Free — Only in mechanically trip-free breakers are contacts and mechanism uncoupled — enabling contacts to open without restriction from mechanism.

It's tried, it's proved! Try it on your system. Compare it to the other circuit breaker operators. For information call your nearby A-C office now, or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 71B7942.

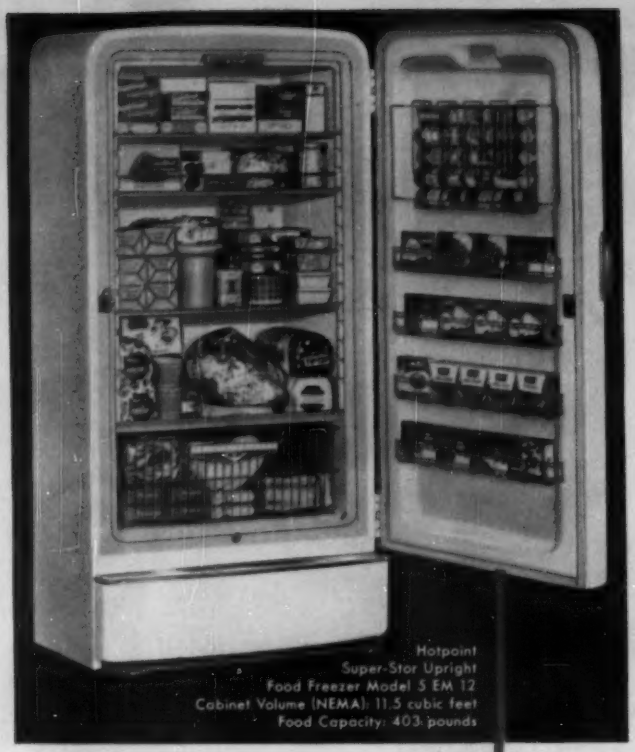
ALLIS-CHALMERS

Milwaukee 1, Wisconsin

BURNDY

• *Factories:* NEW YORK, CALIF., TORONTO • *Export:* PHILIPS EXPORT COMPANY

54-2



Hotpoint
Super-Stor Upright
Food Freezer Model 5 EM 12
Cabinet Volume (NEMA): 11.5 cubic feet
Food Capacity: 403 pounds

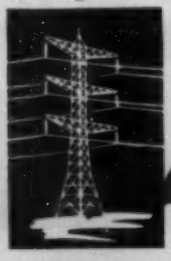
Food Freezers Can Raise Load Factor 5%...

Hotpoint Has Raised Food Freezer Value and Acceptance!

The load factor of the average home with lighting, small appliances, refrigeration, television, electric cooking and electric home laundry equipment is increased from 31% to 36% through the addition of a food freezer. With annual average use of 800 Kilowatt hours and acceptance for freezers more than doubled in five years, here is load worth promoting.

And, it's a load that's easier and more profitable to promote than ever before. Hotpoint's newly-introduced 1955 line of upright and chest-type freezers offers top quality and greater capacity at new low prices. Add to this Hotpoint's hard-hitting new freezer merchandising program, and you've got a combination that can't be beat. Have your Hotpoint Distributor show you Hotpoint's value-packed 1955 freezer line and new merchandising program at your earliest opportunity.

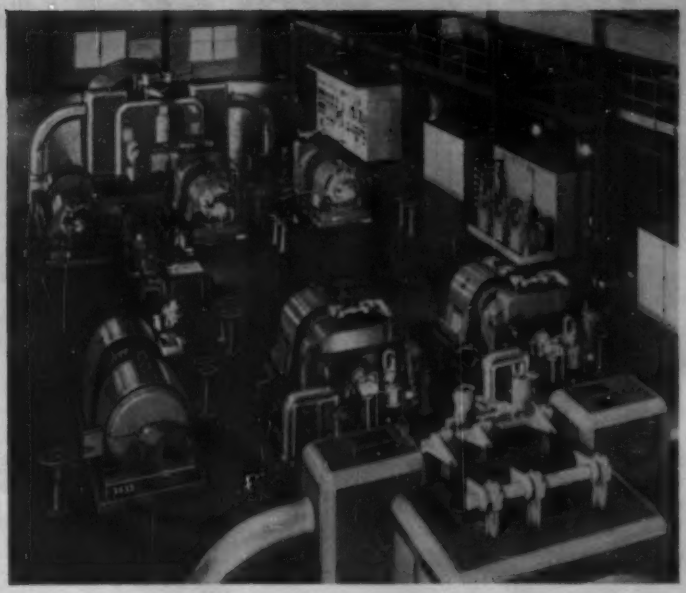
Again, Hotpoint



looks at Tomorrow, Today!

HOTPOINT CO. *(A Division of General Electric Company)* **5600 West Taylor Street, Chicago 44, Illinois**

What makes a barrel-type boiler feed pump *stay in service?*



Here are some of the design features that assure dependability

Today's modern multi-stage centrifugal pumps for boiler feed service are the result of years of research and design. To provide efficient service *plus* dependability, De Laval has incorporated these important features in its barrel-type pump.

Double Volute Diaphragms

Double volute diaphragms provide for radial hydraulic balance and assure a continuous rising head characteristic from the design point to shut-off. *RESULT—Higher efficiencies are maintained over a wider range of operation than are generally obtained with other forms of velocity pressure conversion.*

Individual Diaphragm Bolting

Elimination of rabbet fits and gaskets permits straight metal-to-metal contact of adjacent lapped faces of the diaphragms which are individually bolted together to maintain tight joints and ease of assembly. *RESULT—Positive assurance against inner case leakage, complete elimination of misalignment causes and a minimum of distortion from sudden temperature changes.*

Positive Sealing Between Suction and Discharge Chamber

Inner assembly is held at the inner high pressure joint at the suction end of the barrel, against a flexitallic gasket, with through bolts. The joint between the suction and discharge chambers is made tight during assembly—remains tight whether pump is operating or idle. *RESULT—No possibility of leakage or gasket loosening due to changes of force on the inner joint.*

Bare Shaft

Bare shaft construction with split ring-shrink fit method of impeller mounting permits a scalloped shaft design and eliminates the need for spacer sleeves between impellers. *RESULT—Better hydraulic conditions at the eye of the impeller and elimination of spacer sleeves—the greatest cause of shaft warpage.*

Wearing Rings

Diaphragms and impellers have renewable wearing rings. Impeller rings are threaded on the impeller hubs against rotation, and diaphragm rings are held by a breech lock fit in the diaphragms. *RESULT—Construction permits renewal of original clearances without major part renewal or modification. Labyrinth type diaphragm ring results in minimum leakage over a longer period of time than with close clearance flat rings.*

IMO Oil Pump

A De Laval IMO pump designed for high speed operation is direct-connected to the outboard end of the barrel pump shaft, and is sized to lubricate both pump and driver bearings. *RESULT—Quiet, pulsation-free, positive displacement IMO pumps, assures positive lubrication and eliminates the need of extra shaft length and mechanical complications required by gear drive lube oil pumps.*

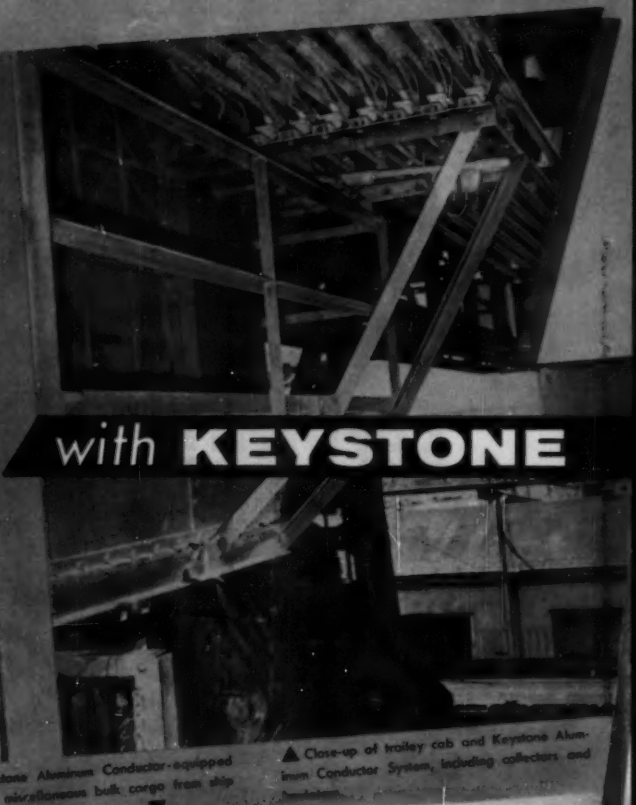
BULLETIN CONTAINS HELPFUL DATA

This De Laval bulletin on the barrel-type boiler feed pump covers all major design points . . . has cross-section cut-away illustration for easy reference. Write on your business letterhead for your copy of Bulletin 1506 to De Laval Steam Turbine Company, 861 Nottingham Way, Trenton 2, New Jersey.

Unloads with GREATER SPEED... LESS

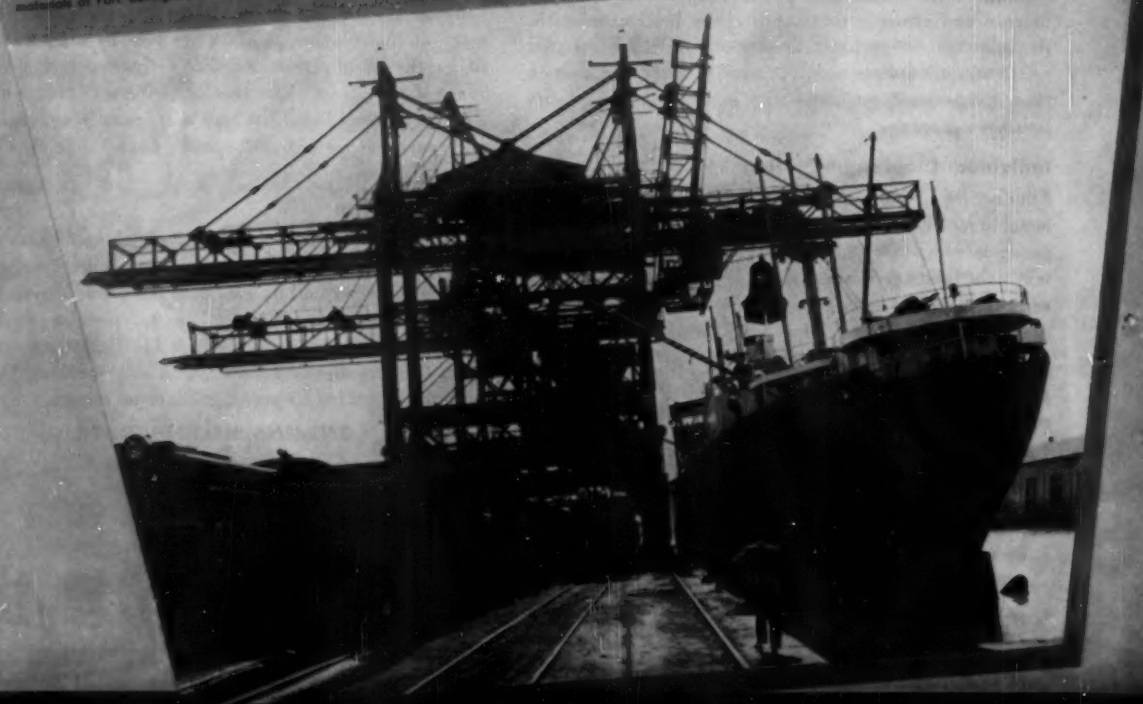
with KEYSTONE

Bird's-eye view of operations during unloading of bulk materials at Port Covington, Baltimore Harbor.



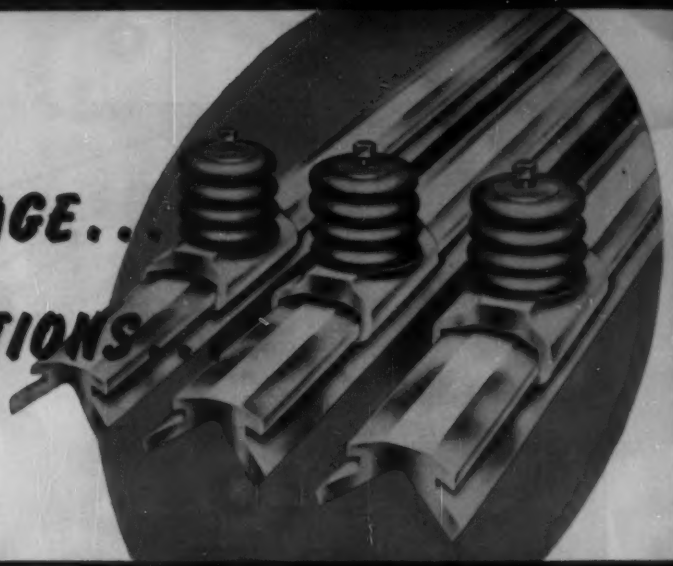
Trolley on Keystone Aluminum Conductor-equipped tower transfers miscellaneous bulk cargo from ship holds to waiting freight cars.

▲ Close-up of trolley cab and Keystone Aluminum Conductor System, including collectors and fasteners.



ELECTRIC SERVICE MFG. CO.

MAINTENANCE...
INCREASED TONNAGE...
FEWER INTERRUPTIONS



Integrated Aluminum Conductors

at **Western Maryland Railway**

FASTER, more economical handling of ore and other materials has resulted from replacement, with a KEYSTONE Integrated Aluminum System, of all old trolley conductors on the double-apron unloading tower at the Western Maryland Railway docks at Port Covington, Baltimore Harbor.

SPEEDY CARGO TRANSFER from ship-to-shore is important in getting highly competitive ore-unloading business along the Eastern Seaboard. Ship operators want fast unloading, to give them quick ship turn-around . . . less time for ships in port . . . more time for profitable cargo-carrying.

TO SPEED turn-around, Western Maryland Railway modernized its facilities by replacing old copper and steel conductors with Keystone aluminum a year ago. Benefits resulting from it are:

Higher Speeds **. . . no longer a need to "trolley" at low speed to avoid breakdowns; greater efficiency in power conductor gives unloader more "pickup" capacity.**

Fewer Work Stoppages **. . . new conductors eliminate frequent breakdowns and derailments.**

Greater Tonnage **. . . from overall greater efficiency; more ships now unloaded without proportionate increase in cost.**

Cheaper Maintenance **. . . due to fewer conductor breakdowns while unloading; upkeep reduced to regularly scheduled, less costly preventive maintenance. Equipment burnouts sharply reduced.**

Why THE KEYSTONE INTEGRATED ALUMINUM CONDUCTOR SYSTEM GIVES LONGER, BETTER SERVICE

Durable **— Aluminum lasts longer in destructive atmospheres. Contact surfaces stay smoother and cleaner than steel . . . prolong shoe life. Multiple contact collectors prevent arcing and heating. Less vibrating weight saves insulators.**

Lightweight **— Permits prefabrication of units, to reduce cost of installation, insulators and supporting structures. Compact design saves space, permits better protection with standard enclosures.**

Voltage and Capacity **— Non-magnetic aluminum increases current capacity through lower reactance, and permits closer conductor spacings. Ample capacity for other equipment without need for boosters or multi-point feeds. Pre-engineered systems now operating to 6000 amp capacity.**

Write today for Booklet 439 on Keystone Integrated Aluminum Conductor Systems.

Philadelphia 32, Pa.

Ask a Lineman!

WIRE COVERED WITH "BAKELITE" POLYETHYLENE WEIGHS LESS • PULLS EASIER • STRIPS FASTER

No one knows better than "the man on the hooks" how BAKELITE Brand Polyethylene makes his job easier!

The excellent mechanical and electrical properties of BAKELITE Polyethylene compounds permit smaller diameters in line wire—for easier handling. These wax-smooth materials stay tough and flexible at —70 deg. C. . . . resist deformation in temperatures as high as 90 deg. C. BAKELITE Polyethylene won't festoon. It resists oil, grease, alkalies, most strong acids, abrasion and mildew. Tests with the black compound indicate a service life of several decades.

Get all the facts on BAKELITE Polyethylene for use in wire construction by writing Dept. JE-53. Ask for Kabelitems No. 48.

***For Line Wire, Signal Systems and Service Drop**—wet or dry—the power factor of BAKELITE Polyethylene (black compound) is only 0.004 at 25 deg. C.; dielectric constant is 2.3. Electrical properties of polyethylene resin stay constant through a frequency range of 60 cycles to 50 megacycles. Temperatures in the vicinity of 90 deg. C. have little effect on electrical properties. Volume resistivity is so high it can be measured only by very sensitive instruments. Voltage breakdown resistance is excellent, even after long-term water immersion.*

BAKELITE
BRAND
POLYETHYLENE
FOR WIRE COVERING

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

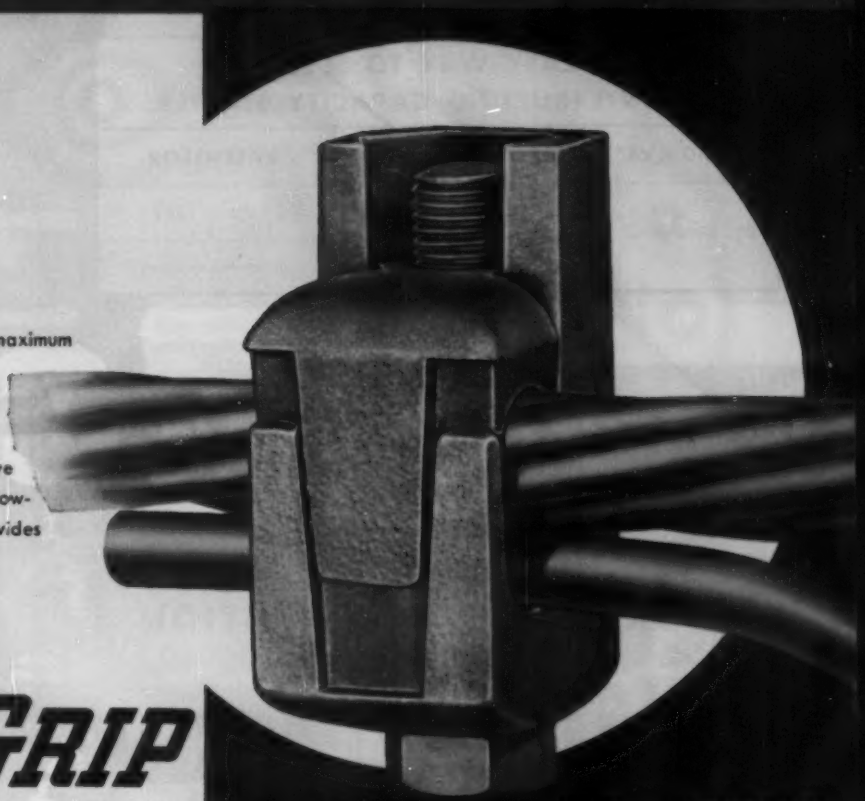
Anderson's SUCCESSOR to the SPLIT BOLT

EXTRA Strength...
high strength bronze alloy bodies and high-tensile silicon bronze bolts.

EXTRA Savings...
re-usable, time and time again.

EXTRA Fast... simple, one-piece construction allows installation over two maximum size conductors without disassembly. No falling off line during assembly.

EXTRA Dependable... positive high-pressure clamping action maintains low-resistance contacts. Design of "jaws" provides complete enclosure of the conductors.



HIGH STRENGTH BRONZE ALLOY

Dura-Grip "DG" CONNECTORS

The answer to any problem of high-pressure contact in their cable range . . . especially designed to meet today's increasing loads on distribution systems. The extra clamping strength of Anderson's "DG" Connectors assure trouble-free, long-life connections. Long, strong "jaws" plus long silicon bronze bolts combine to provide linemen with a truly "fumbleproof" connector that will save time and eliminate handling difficulties. They will "hang" without turning over . . . no nuts to lose . . . no need *ever* to completely disassemble.

Catalog Number	Cable Range Max. Solid	Max. Str.	Max. Nominal Cable Diameter
DG-8	6	8	0.162
*DG-8SH	6	8	0.162
DG-6	4	6	0.210
*DG-6SH	4	6	0.210
DG-4	3	4	0.233
DG-2	2	3	0.258
DG-1	1	2	0.292
DG-1/0	2/0	1/0	0.368
DG-2/0	3/0	2/0	0.414
DG-4/0	4/0	4/0	0.522

*Furnished with slotted head bolts

NOTE: Minimum clamping range is one maximum conductor.

FOR MORE COMPLETE INFORMATION... consult your nearest ABW representative or contact our home office.

ABW

Aluminum & Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS *for over a Quarter Century*

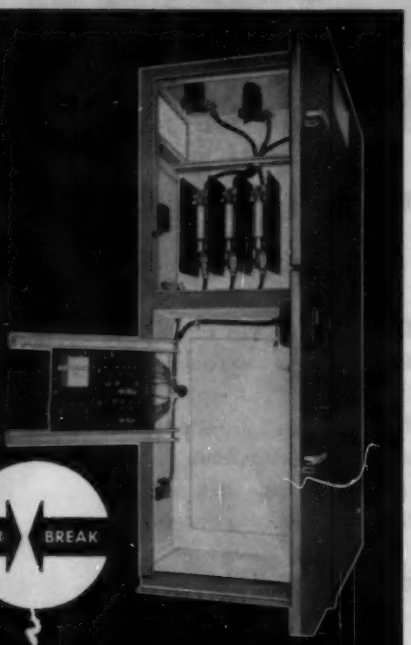
ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 BIRMINGHAM 1, ALABAMA

AN EASY WAY TO SELECT HIGH INTERRUPTING CAPACITY STARTERS

50,000 KVA*	POWER FUSES		VALIMITOR	
2200-5000 volts	2300 Volts	4800 Volts	2300 Volts	4800 Volts
	150,000 kva	250,000 kva	unlimited kva bus	

* Certified



On Air-Break ZHA Starter, overload relay panel swings out. Opening of inner door gives access to motor terminals and rear of contactor.

YOUR BEST BUY FOR SHORT CIRCUIT PROTECTION

EC&M (2200-5000 VOLT) MOTOR STARTERS

EC&M Oil Break Starter of VALIMITOR type has ZHS 50,000 KVA Contactor mounted under oil in rear tank.

No matter how you figure it . . . high voltage motor starters, with adequate interrupting capacity, are your best investment.

Should a fault occur, vital drives are protected by clearing the circuit quickly. The need for extensive repairs or replacements has been minimized. Down-time is reduced. This results in lower costs.

Although short circuit values get greater as KVA capacities grow, EC&M's complete line of Motor Starters provides a wide range of selection to cover any requirement. They are available in Oil and Air-Break styles having interrupting capacity ratings shown above . . . note there are 3 ratings in both oil and air break.

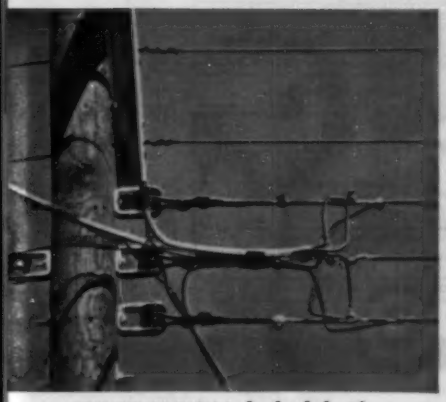
The ceiling on the short circuit problem has been lifted. Be sure you have the information on this wide choice of EC&M Motor Starters for 2200-5000 volt motors.

Write for handy new catalog 6062 showing complete coverage of 2200-5000 volt motors.

THE ELECTRIC CONTROLLER & MFG. CO.

4498 LEE ROAD • CLEVELAND 28, OHIO

ANACONDA'S TYPE K service drop cable. Tough aluminum ribbon covering over neoprene-insulated conductors reduces outages caused by foreign objects.



POLE END OF CABLE is deadended with aid of grip attached to secondary neutral bracket by service clevis.

HOUSE END IS ATTACHED by cable clamp and service hook. Type K cable bends without loosening ribbons to provide drip.

DIRECT TO METER. Type K may be installed from pole to outdoor meter without splice or tap where local ordinances permit.

TYPE K SERVICE DROP ASSURES LONG TROUBLE-FREE OPERATION

To help cut trouble calls and costs, Anaconda offers Type K aluminum service drop cable for pole to meter run.

This cable gives long, economical service and reduces outages caused by foreign objects during wet weather.

Conductors of Type K are protected by tough, spirally wrapped flat bare aluminum neutral. This covering helps prevent tree limbs and other foreign objects from chafing through the insulation to the conductors and shorting the line.

Type K cable is light, flexible, easy to install. It is neat. And insulation of specially compounded neoprene gives excellent electrical properties.

Ask your Anaconda Salesman or Distributor for full information today. Or write Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

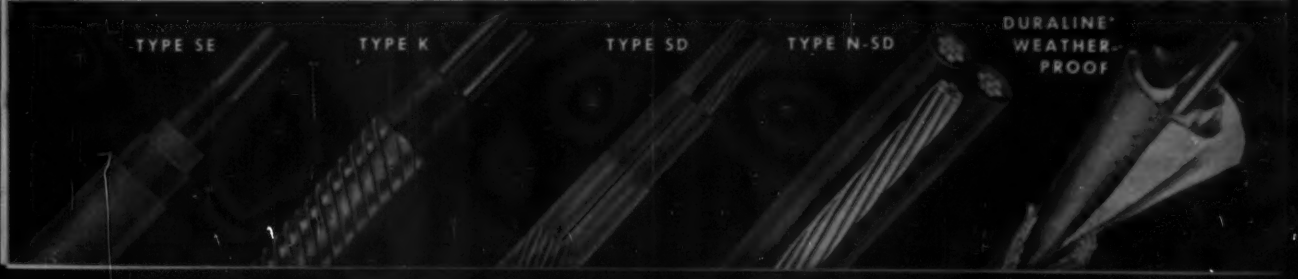
54697

TYPE K service drop cable

ANACONDA®

Single source for every type service drop and entrance cable—in aluminum and copper

*Reg. U. S. Pat. Off.



ELECTRIC POWER

DELCO-REMY A.C. GENERATORS FOR EXTRA-HEAVY ELECTRICAL LOADS

Delco-Remy's new 6- and 12-volt A.C.-D.C. charging systems are the answer to the *extra-heavy* electrical demands of late-model municipal or public utility trucks, cars, and other vehicles equipped with two-way radio, floodlights, or other special electrical units. High wattage output is ample for heaviest electrical loads . . . generators pick up discharged batteries quickly in emergencies. Delco-Remy A.C.-D.C. charging systems are unexcelled at curb-idle . . . furnish up to 180 amperes at higher engine speeds . . . are dependable under the most rugged operating conditions at all engine speeds.

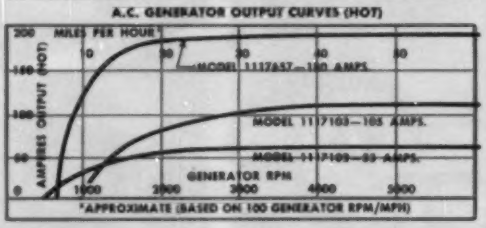
Application packages for both 6- and 12-volt generators, complete with installation instruction sheets for popular makes of cars and trucks, are available. Conversion is simple. See your nearest United Motors distributor for additional data.

A.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-In RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1117101	12	525	29	55	825	All speeds.
1117103	12	960	5	105	1575	All speeds.
1117657	12	530	130	180	2700	All speeds.
1117062-3-4	6	750	38	90	720	All speeds.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

A.C. GENERATOR OUTPUT CURVES (HOT)



*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

DELCO-REMY D.C. GENERATORS FOR MEDIUM-TO-HEAVY ELECTRICAL LOADS

Delco-Remy's 6- and 12-volt extra-output D.C. generators are an economical answer to the electrical needs of late-model municipal or public utility trucks, cars . . . other vehicles with additional lights, two-way radios, or other special electrical equipment in medium- to heavy-duty service in suburban areas. Delco-Remy extra-output D.C. generators are low in cost, simple to install, economical to maintain. Performance data on Delco-Remy extra-output D.C. generators are shown at the right.

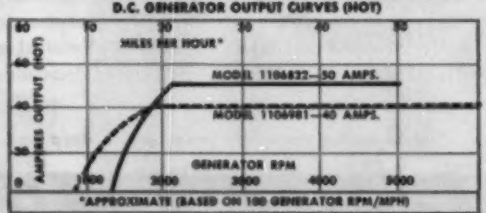
For further details and application data, see your nearest United Motors distributor.

D.C. GENERATOR PERFORMANCE DATA (HOT)

Model	Volts	Cut-In RPM	Curb Idle Amperes*	Maximum Amperes	Power Watts SAE	Recommended For
1106832	12	1300	0	50	750	Low to Medium Speeds
1106981	12	825	14	40	600	Low speeds & idling.
1106757	6	830	†	55	440	Medium to high speeds.
1106758	6	540	26	45	360	Medium Speeds and Idling
1106977	6	610	38	55	440	Low speeds & idling.

*APPROXIMATE (BASED ON 1000 GENERATOR RPM)

D.C. GENERATOR OUTPUT CURVES (HOT)

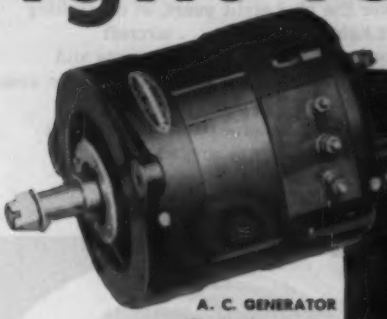


*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

Delco-Remy
ELECTRICAL SYSTEMS

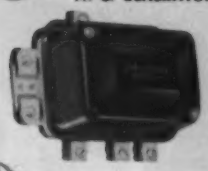
DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

right for the job



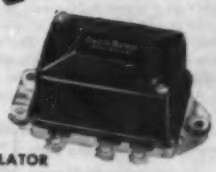
A. C. GENERATOR

REGULATOR



RECTIFIER

D. C. GENERATOR



REGULATOR

A GENERAL MOTORS PRODUCT

A UNITED MOTORS LINE

DISTRIBUTED BY WHOLESALERS EVERYWHERE

FISHER-PIERCE
PHOTOELECTRIC CONTROLS

for every lighting system requirement

The extreme versatility and quality of Fisher-Pierce photoelectric lighting controls is evidenced by their widespread use over the past eight years, in controlling hundreds of street lighting systems . . . aircraft obstruction and beacon lights . . . outdoor signs and store window lights . . . parking, loading and storage area lights . . . poultry house and roadside telephone illumination, etc. All Fisher-Pierce controls employ a basic circuit whose dependability, ruggedness and trouble-free performance have been proven in use.

SERIES 63300C CONTROLS

Rugged, easily installed, accessible units for switching up to 3000 watts of lighting load. For operation at 105-130 or 210-250 V, 50-60 cycles. Standard models come with SPST, SPDT, or DPST power contactors. Special models are available with a switching capacity of 6000 watts. The electronic chassis is enclosed in a weatherproof watt-hour meter case assembly which plugs into a standard meter socket. The new 63300C design represents the results of eight years' extensive, specialized experience in the field.

SERIES 64400 CONTROLS

Small, compact, low cost units for switching 1000 watts of incandescent, mercury or sodium vapor lamps at 120 V, 50-60 cycles. Designed for use as an integral part of various manufacturers' luminaires, as well as for ballast, pole top, cross arm, standard and other mountings. Low initial cost and low maintenance make the use of one Series 64400 control per lamp economically practical for new street lighting installations and isolated locations.

THE
nitelighter

. . . for automatic control of home lights

An inexpensive, compact, automatic control made especially for domestic use. Operates on 110 volts AC, switches up to 300 watts. Plug lamp to be controlled into NITELIGHTER plug, face "eye" toward window; living room, hall, garage lights, etc. go on at dusk, off at dawn automatically and without attention. You'll never come home to darkness. Protect the home when you're away. Get it at your dealer, or if he cannot supply you, send a check or money order for $15.95. A NITELIGHTER will be sent postpaid and insured.

Series 100

MULTIPLE RELAYS FOR SWITCHING LOW VOLTAGE OUTDOOR LIGHTING CIRCUITS

Fisher-Pierce multiple relays incorporate a maintenance-free mercury plunger relay conservatively rated to switch 30 amps. at 110-115 volts AC. Series 100 relay is housed in a standard meter case and is available with or without line and coil protective equipment. The low cost Series 200 (not shown) is housed in a weatherproof cast aluminum case. Both series are designed for outdoor use as pilot wire control or for cascading street lighting circuits. Available with normally open or normally closed relays.

Complete Specifications and Data Available on Request

THE FISHER-PIERCE COMPANY, INC.

82 Pearl Street, So. Braintree, Boston 85, Mass.

EXPORT: PHILLIPS EXPORT CORP.
DIVISION OF NORTH AMERICAN PHILLIPS
100 E. 42ND STREET NEW YORK 17, N. Y.

IN CANADA:
NORTHERN ELECTRIC
CO., Ltd.

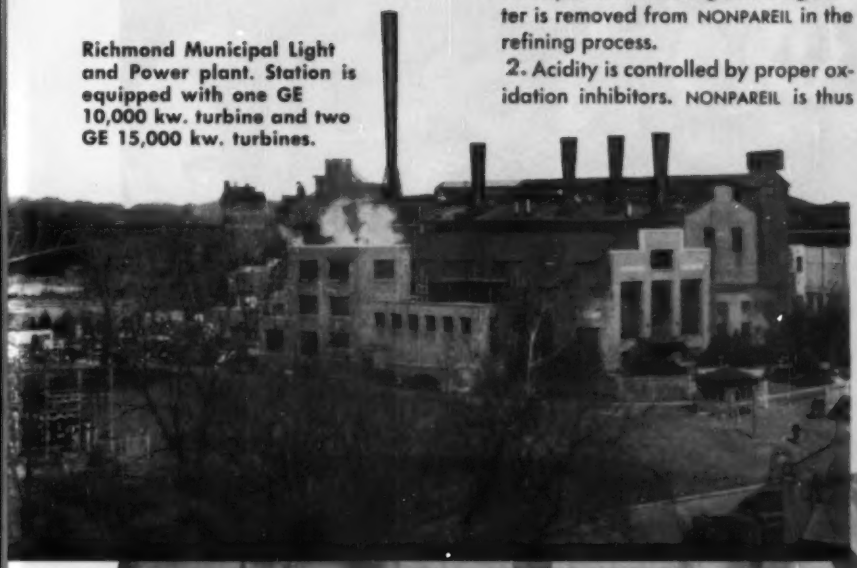
NONPAREIL *in service 21 years— no worries about turbine oil failure at Richmond*

Richmond, Indiana, Municipal Light and Power plant, first installed NONPAREIL Turbine Oil in two GE turbines in 1934. One turbine is 10,000 kw., the other 15,000 kw. The same NONPAREIL Turbine Oil—plus usual makeup—has been in service in these turbines ever since. Another 15,000 kw. turbine installed in 1948 has also used NONPAREIL since start up. In each unit NONPAREIL has lived up to its guarantee to last for however long the turbines are in service.

NONPAREIL Turbine Oil can deliver this outstanding service because:

1. Asphaltene or sludge forming matter is removed from NONPAREIL in the refining process.
2. Acidity is controlled by proper oxidation inhibitors. NONPAREIL is thus guaranteed never to exceed an acidity level of 0.15 mg. KOH/g. In most cases oil acidity is maintained at levels near 0.05 mg. KOH/g.

Want to know more about NONPAREIL Turbine Oil? In the Midwest, call your nearby Standard Oil office. Or contact, Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Ill.



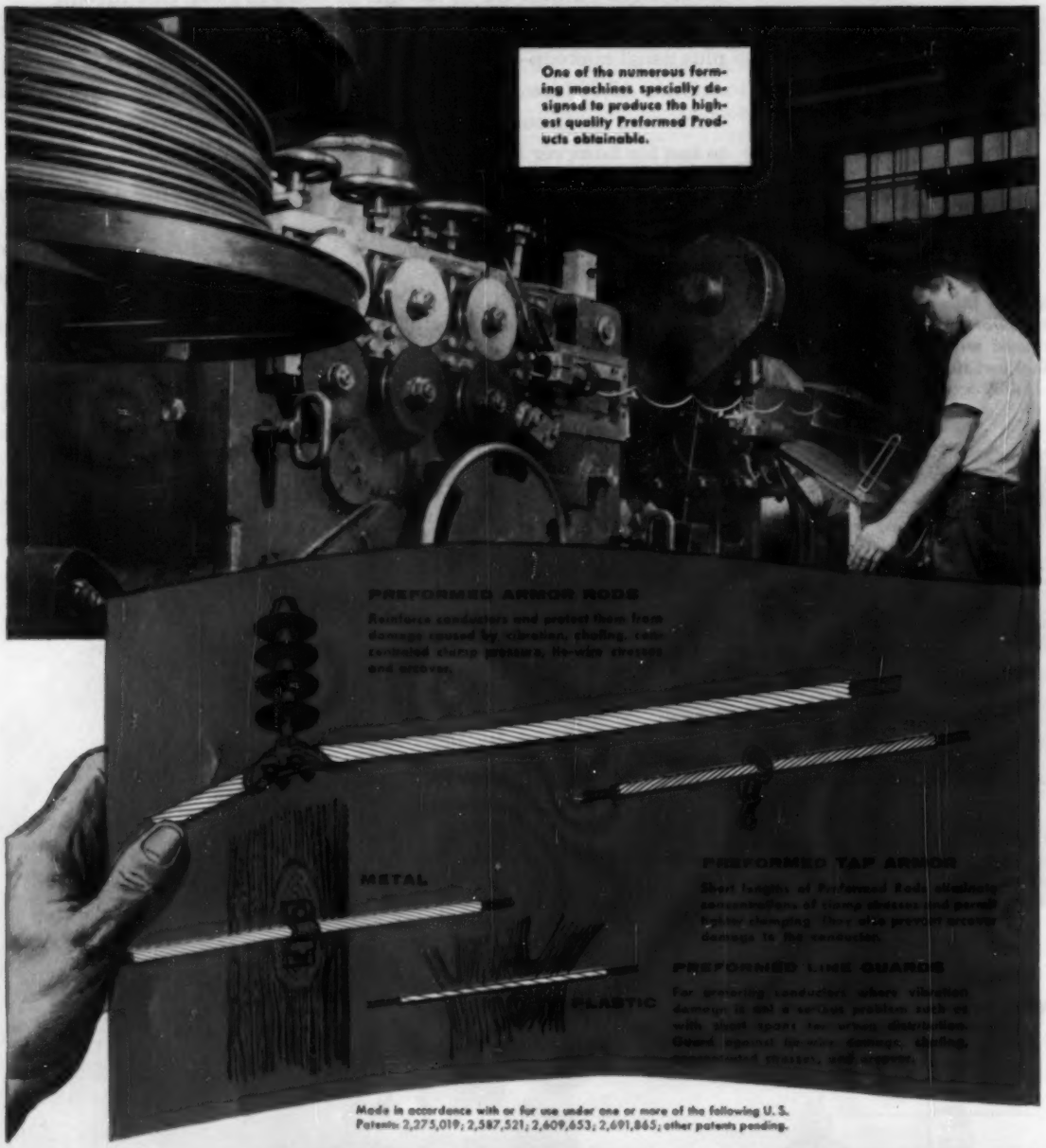
Richmond Municipal Light and Power plant. Station is equipped with one GE 10,000 kw. turbine and two GE 15,000 kw. turbines.

NONPAREIL Turbine Oil has lived up to guarantee for 21 years in two turbines at Richmond, Indiana. Another turbine has used NONPAREIL 7 years.

STANDARD

STANDARD OIL COMPANY (Indiana)

PREFORMED


One of the numerous forming machines specially designed to produce the highest quality Preformed Products obtainable.
PREFORMED ARMOR RODS
METAL
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PREFORMED TAP ARMOR
PREFORMED LINE GUARDS

Made in accordance with or for use under one or more of the following U. S. Patents: 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE, CLEVELAND 3, OHIO

TELEPHONE: CLEVELAND EXPRESS 1-3571

PRODUCTS

proved performance

The precision manufacturing equipment at Preformed Line Products Company has been especially designed to produce uniform, accurate rods for all Preformed Products. That's why one PLP Rod is exactly the same as another of the same size and why all pitches within each rod are absolutely uniform. This precision equipment plus the skill accumulated in years of manufacturing Preformed Products guarantees that they meet the exacting specifications developed in the laboratories of the Preformed Line Products Company.

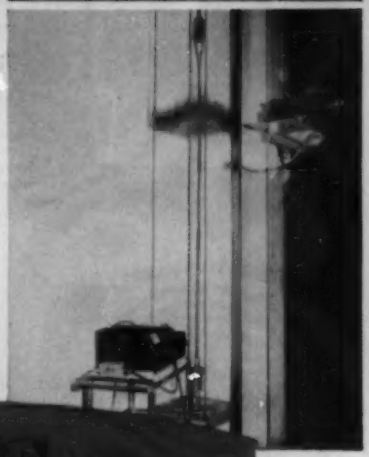
Preformed Research and Development Laboratories are the main reason why the demand for more and more Preformed Products is constantly increasing. From these laboratories (which have been continually enlarged in both staff and the most modern research equipment) has sprung the whole new Preformed concept of fittings, the most advanced development in this field in recent decades.

All Preformed Products are designed to hold the conductor or strand with low radial pressure over a large area that is free of concentrated stress at any point. Bolts or other holding devices are eliminated—providing economies unobtainable with any other type of fittings.

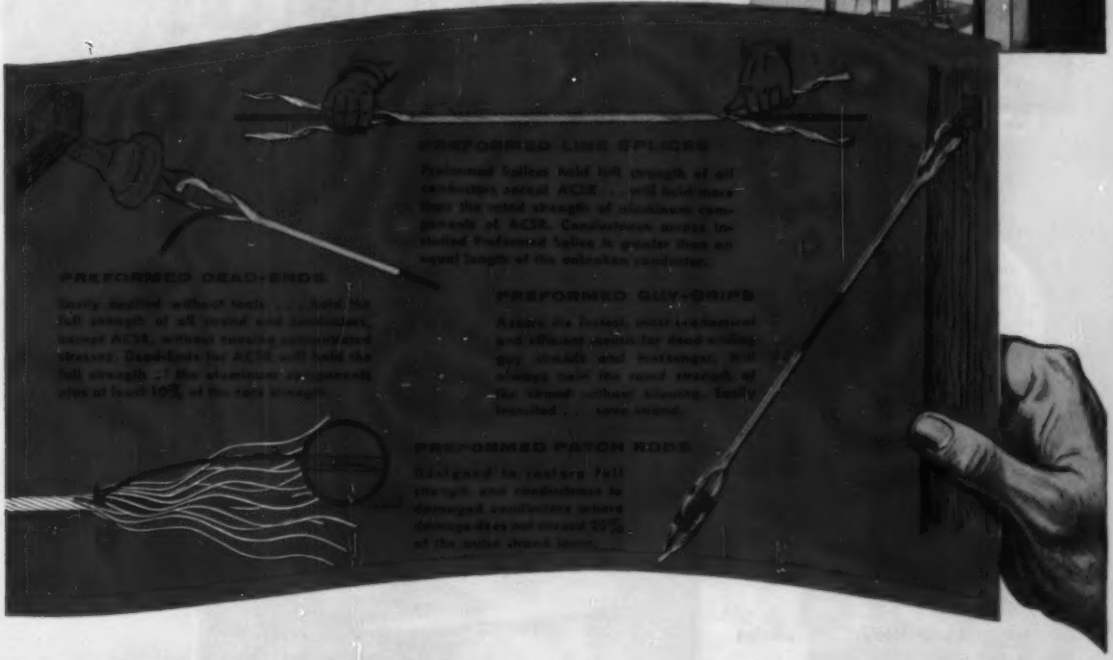
For more information on their exclusive advantages, ask your local PLP Representative.

a Static tension tests prove the holding ability of Preformed Products under high stress.

b Severe repeated load tests are regularly conducted in the Preformed Laboratory.



c Preformed Products withstand tremendous impact — another routine quality control test.



SALES REPRESENTATIVES C. B. Anderson Co., *Tulsa, Oklahoma City, Amarillo* • Belcher and Associates, Inc., *Jacksonville, Miami* • Bergstrom-Verberg Co., *Minneapolis* • Harry J. Billica, *San Mateo* Vincent J. Brown Co., *Buffalo* • Burns Electric Co., *Pittsburgh* • F. C. Clatterbaugh, *Omaha* • Earl S. Condon Co., *Los Angeles* • Cory and Crum, *Indianapolis* • The Electrical Distributors Co., *Philadelphia* • Engineer Sales Co. of Carolina, *Columbia* • J S G Electric Co., *Chicago* • E. L. Flowers, *Boston* • George R. Horne and Co., *Dearborn* • Johnson Sales Co., *Bay City* • H. L. Macon and Co., *Atlanta* • Peterson Co., *Denver* • Elgin E. Robertson, Inc., *Dallas, Houston* • K. M. Ryals Co., *San Francisco* • Sheffer and Nelson, *Portland, Seattle, Spokane* • M. H. Snyder & Sons, *New York* Curtis H. Stout & Co., *Little Rock, Memphis, New Orleans* • L. G. Wendegatz, *Kansas City*

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Irregular shaped ceilings often posed difficult lighting problems ...until GrateLite was invented. This is a louver that can be fitted to any shape!

results:

A new concept of ceiling design that distributes the light evenly throughout the room without glare and annoying shadows—an inviting, eye-soothing illumination of high intensity at low brightness.

MARTIN DELICATESSEN, UNIONTOWN, PA.

Beauty treatment for odd-shaped ceilings...

GUTH GRATELITE*

LOUVER-DIFFUSERS

*TM Reg. U.S. & Can. Pats. Pend.

LUTZ DRUG STORE, SAGINAW, MICHIGAN

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THE EDWIN F. GUTH COMPANY
ST. LOUIS 3, MO.

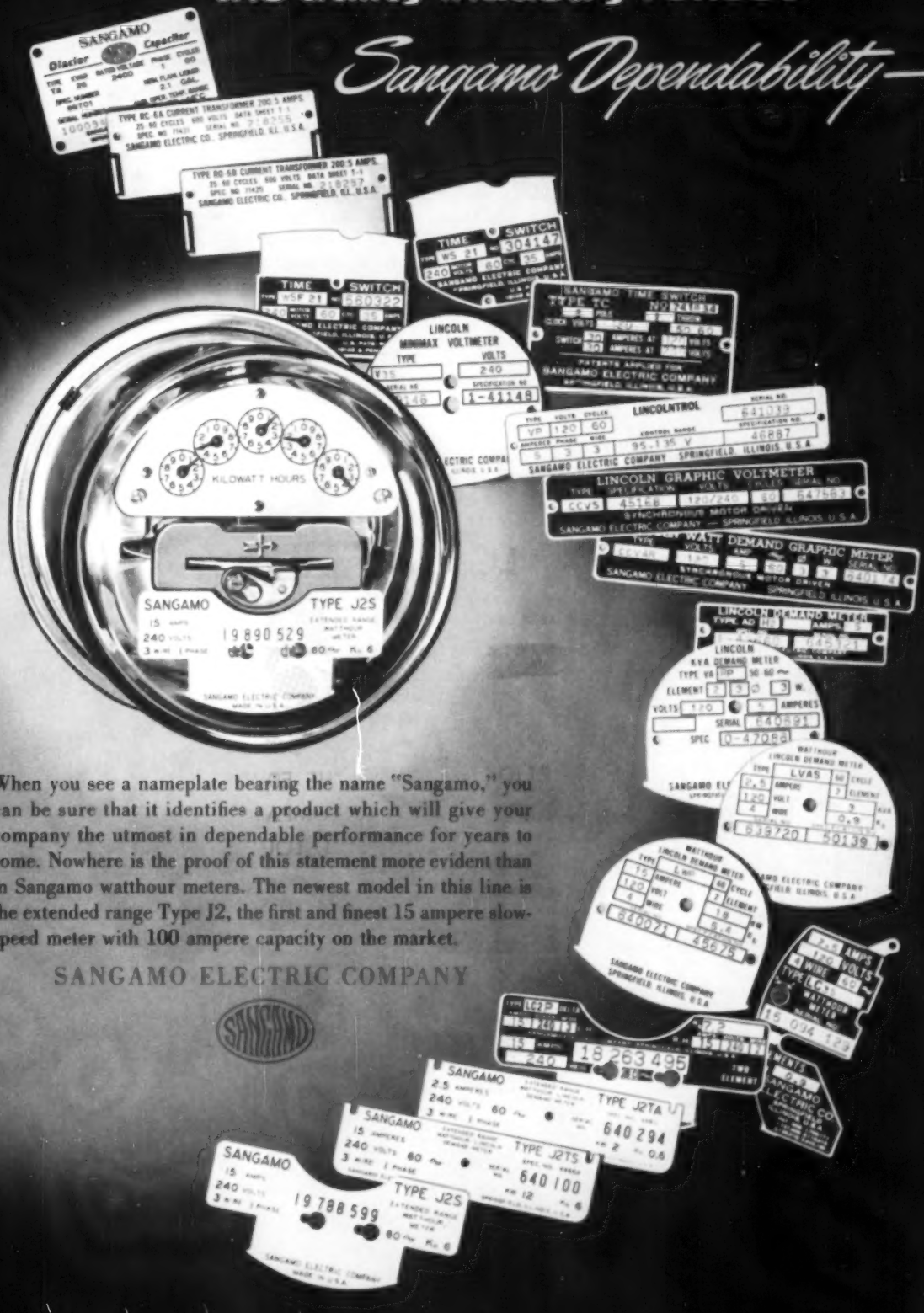
trusted NAME IN LIGHTING SINCE 1902

May we send you detailed information and layout guide FREE?

DODGE AGENCY GEN. OFFICE, SALINA, KAN.

These nameplates on equipment used by the utility industry reflect

Sangamo Dependability—

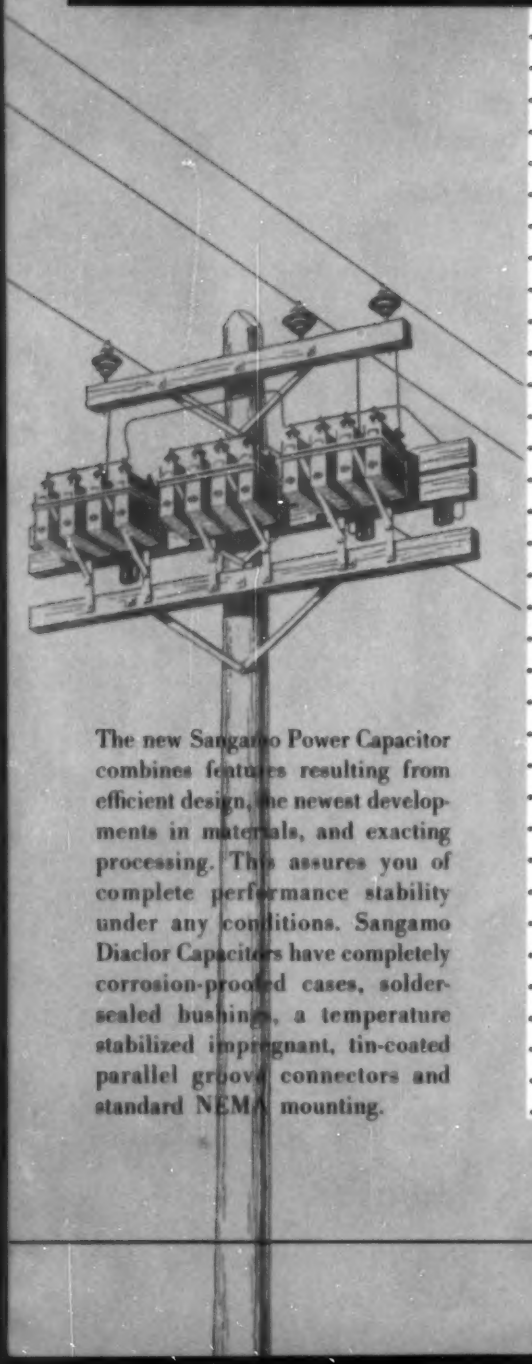


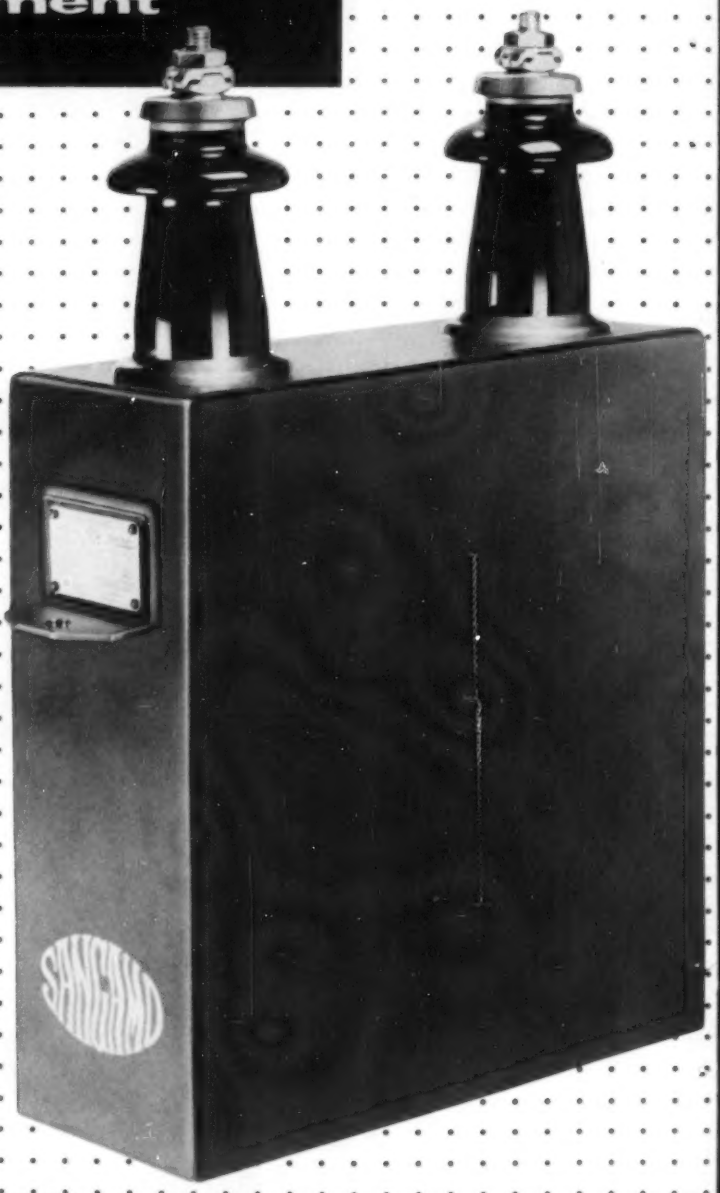
When you see a nameplate bearing the name "Sangamo," you can be sure that it identifies a product which will give your company the utmost in dependable performance for years to come. Nowhere is the proof of this statement more evident than in Sangamo watthour meters. The newest model in this line is the extended range Type J2, the first and finest 15 ampere slow-speed meter with 100 ampere capacity on the market.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD

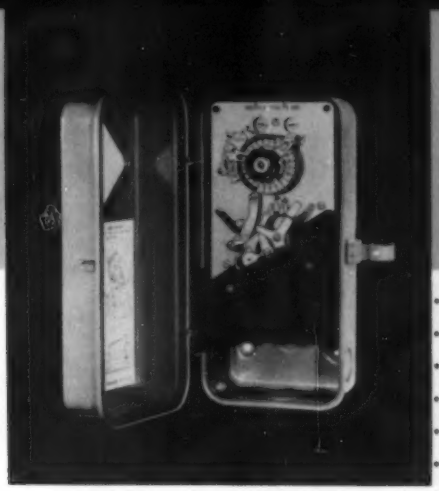
CAPACITORS for Power Factor Improvement



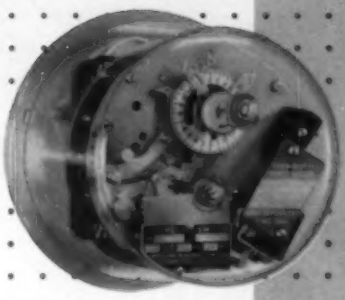


The new Sangamo Power Capacitor combines features resulting from efficient design, the newest developments in materials, and exacting processing. This assures you of complete performance stability under any conditions. Sangamo Diaclor Capacitors have completely corrosion-proofed cases, solder-sealed bushings, a temperature stabilized impregnant, tin-coated parallel groove connectors and standard NEMA mounting.

SANGAMO



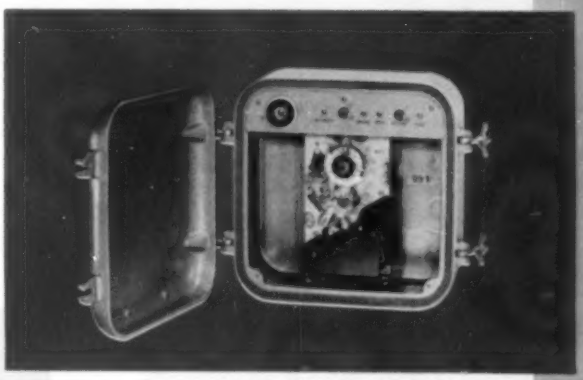
Type W Synchronous-Carryover
Time Switch in conventional case



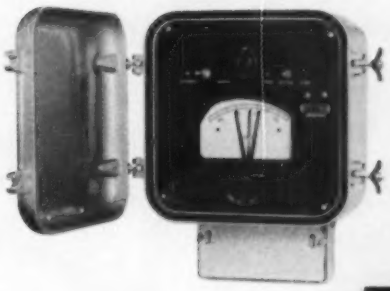
Type WS Synchronous-Carryover
Time Switch for socket mounting

Your power capacitors, switched on the basis of time, will keep exact schedules when equipped with these sturdy synchronously operated time switches with automatic carryover.

Lincolntrols will accurately control your capacitor switching as a function of amperes, volts, watts or vars.



Type WSHOX-12X Fuse-Protected Synchronous Carryover Time Switch for socket mounting, with switches for manual and automatic operation



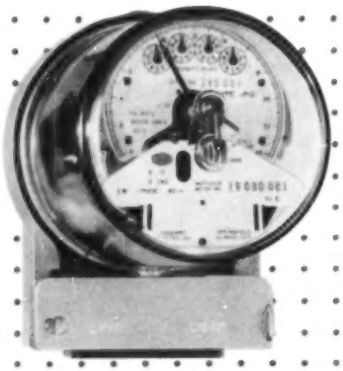
Type VP Lincolntrol. Switches capacitors as a function of voltage. Also available for socket mounting

Capacitor Control Equipment

Meters for Demand Measurement Lincoln Thermal and Mechanical

Type LC3 Polyphase Watthour and Lincoln Thermal Demand Meter

Type J2TS Singlephase Watthour and Lincoln Thermal Demand Meter



Type J2A Singlephase Watthour Meter with JH2 Mechanical Demand Register

Type LC3S 3-element Polyphase Watthour Meter with LCH2 Mechanical Demand Register

SANGAMO

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

You save money by using non-rusting Copperweld* Strand because you pay for only one guy installation during the life of the pole — costly replacements are eliminated. Certainly, this is important — for to replace just one rust-weakened or broken ordinary guy may cost you $100 or more, when you figure the outage and the items of labor, fittings and truck time—plus the cost of the new strand.

Once you put Copperweld Strand up, it's up to stay—its original high tensile strength remains permanent. When you consider its extra staying power, longer life and low overall cost, Copperweld is the most dependable and economical strand you can buy.

*Trade Mark

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION, Glassport, Pa.

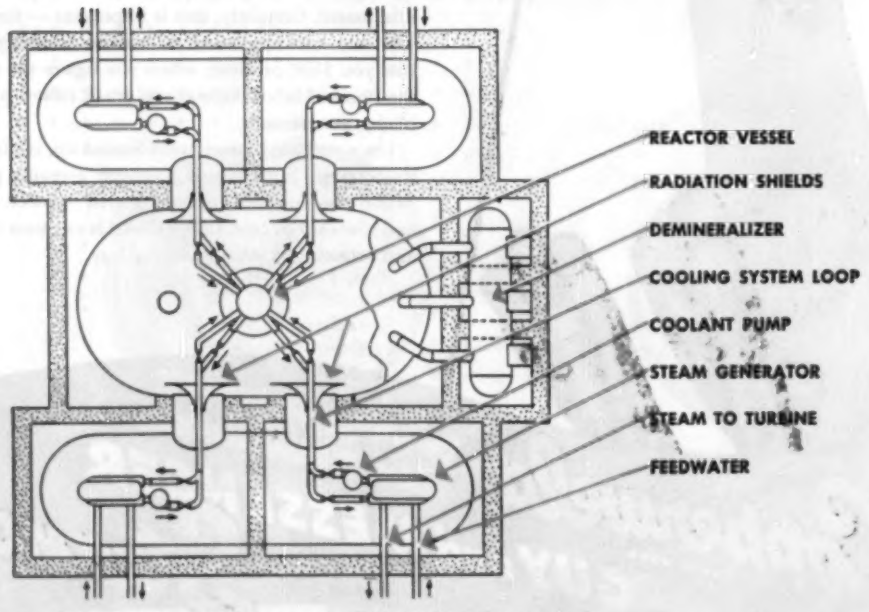
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

1955--our 40th year

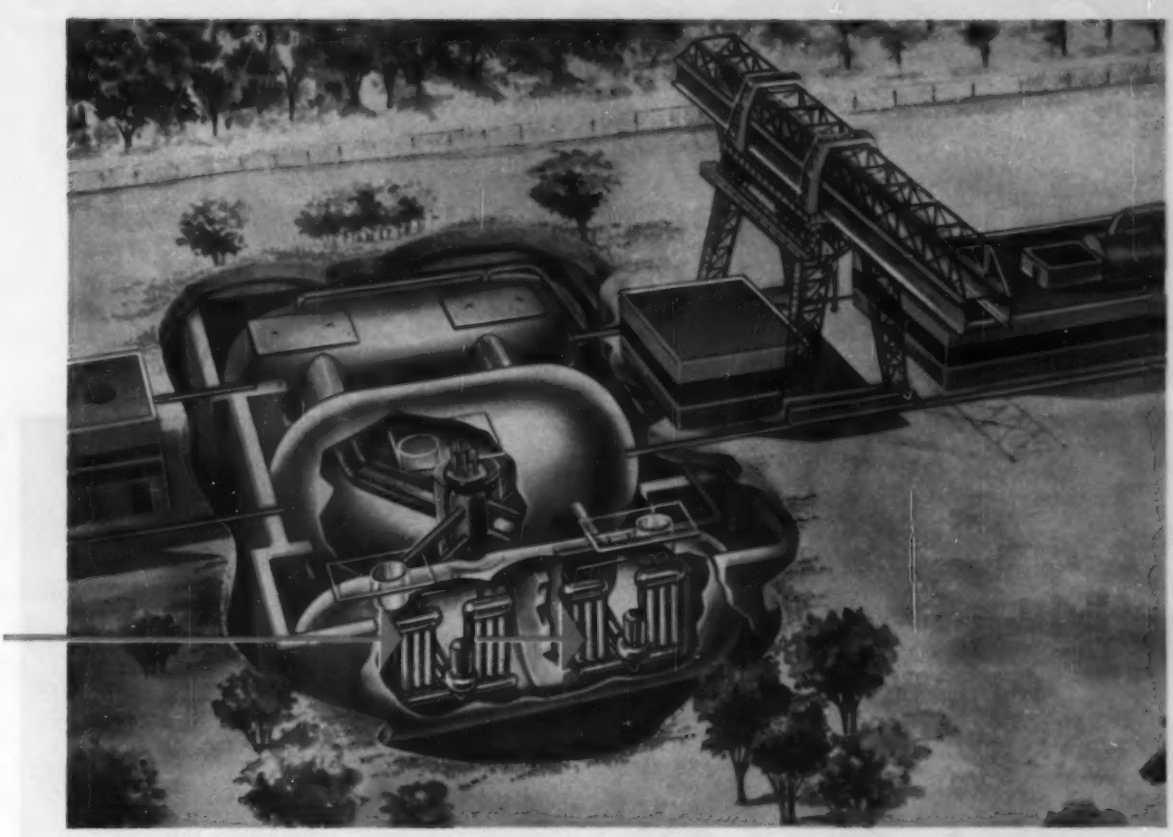
in nation's first full-scale

Atomic Power Plant

Foster Wheeler steam generators will help convert nuclear energy into kilowatts



Schematic plan view of nuclear reactor and steam generator sections of the Duquesne Light Company's atomic power station, now under construction at Shippingport, Pa.



Pressurized water reactor power station at Shippingport marks historic milestone in the generation of electric power

THE atomic power plant of the future is a dream no longer. Ground has been broken and construction is now under way!

Here at Shippingport, Pa., the Atomic Energy Commission and the Duquesne Light Company are cooperating in a joint project, erecting the nation's first full-scale atomic power generating station. This nuclear power plant will make an historic contribution to the entire electrical industry.

The nuclear reactor portion of the plant which is being built for the AEC by Westinghouse Electric Corporation will be located underground in huge, shielded steel shells as shown in the artist's sketch above. The steam generators (heat exchangers) will convert heat from the reactor to 600 psia steam for driving the turbo-generator.

In designing and building two of the four steam generators for this first commercial atomic power plant, Foster Wheeler will bring to bear a wealth of practical experience in the nuclear power field. Since the administration of the Manhattan District, wartime predecessor of the AEC, Foster Wheeler has been actively engaged in atomic energy work. FW nuclear power heat exchangers are installed at the National Reactor Testing Station, the Knolls Atomic Power Laboratory, and on board the U.S.S. "Nautilus"—first atomic power submarine.

In conventional or atomic power plants, heat engineering by Foster Wheeler means efficient and dependable steam generation at low overall cost. For the latest Nuclear Forecast and information on a low-cost Nuclear Power Plant, write for HE-5-55. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

FOSTER WHEELER

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DROP FORGING makes

Specify BTC Drop-Forged Hi-Line Hardware

BTC

conductor strain clamps *better*

BTC STRAIN CLAMPS offer a dependable, efficient method of dead-ending conductors on strain and angle construction.

They are designed for all conductors in general use . . . for all classes of construction . . . for all voltages . . . for all line current loads . . . and for all conditions of atmospheric corrosion.

5000 SERIES
Steel Strain Clamps. Drop-forged steel, hot-dip galvanized, suitable for all conductors.

5200 SERIES M.P.L.
(Minimum Power Loss) Aluminum Strain Clamps. Drop-forged, heat-treated Aluminum Alloy Clamps for A.C.S.R. and All-Aluminum Conductors. BTC Minimum Power Loss Clamps reduce hysterisis and eddy current power losses, eliminate conductor heating effects and improve corrosion resistance.

The general design of BTC Conductor Strain Clamps combines the superior mechanical properties and lighter weight of forged metal parts with a considerable reduction of the factors that cause conductor-vibration damage. Slip strengths are more than adequate.

Installation of these clamps is both easy and economical. No special tools are required. The conductor may be strung between clamps or from clamp to apparatus without cutting or splicing, insuring permanently trouble-free operations.

BTC offers you a complete line of Conductor Strain Clamps, in a wide range of sizes, enabling you to select just the right clamp for your conductor.

BTC

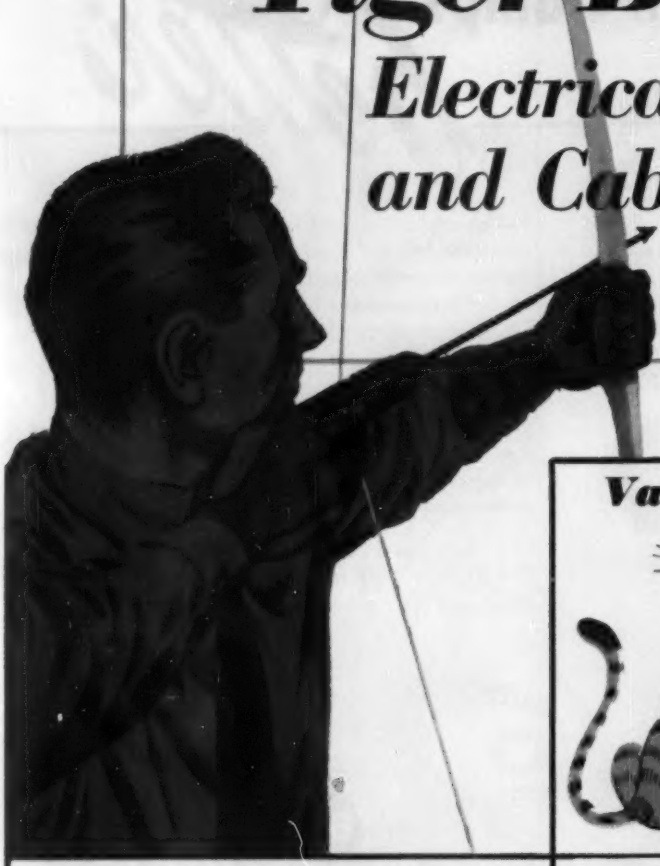
The BREWER-TITCHENER CORPORATION
Cortland, N. Y.

. . . From Your Insulator Manufacturer

You just can't miss with

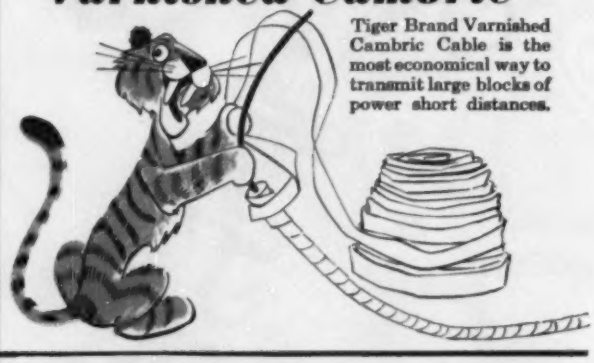
Tiger Brand

Electrical Wire and Cable



Varnished Cambric

Tiger Brand Varnished Cambric Cable is the most economical way to transmit large blocks of power short distances.



Amerclad

To withstand physical abuse, moisture, sun and oil, use Tiger Brand Amerclad for all sorts of portable equipment.

Amerbestos

Tiger Brand Amerbestos is a true *quality* heat resistant material. The asbestos is *felted* for greater durability.

Submarine For underwater power distribution, there's a Tiger Brand Submarine Cable to withstand any operating condition.

Ampyrol

Tiger Brand Ampyrol features thin-walled thermoplastic insulation, brilliantly color coded, easy to strip.

Paper

Leading utilities specify Tiger Brand Paper Insulated Cable for their most critical high voltage installations.

American Steel & Wire *specializes* in wire and cable that must withstand abusive service. No matter what kind of operating condition you may have, there is probably a *standard* Tiger Brand Wire or Cable that will give you better service than you ever dreamed of.

Send the coupon and outline your problem. We'll see that you get service—*fast.*

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- mold cured portable cord
- aerial, underground and submarine cable
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- paper & varnished cambric cable
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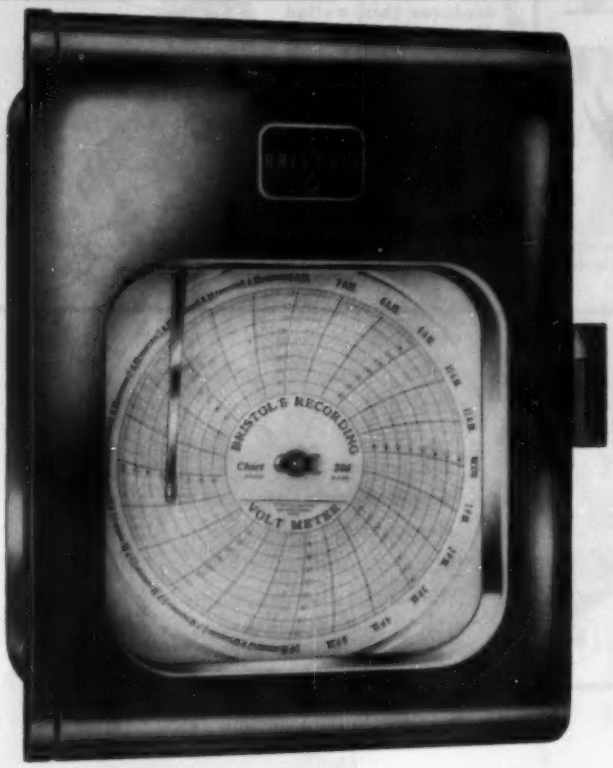
USS

UNITED STATES STEEL

WHAT'S NEWS AT BRISTOL . . .

How do you pick the right recording ammeter or voltmeter?



PERMANENTLY MOUNTED Bristol Voltmeters and Ammeters come in three models: interchangeable surface and flush, surface-panel, and flush panel.

The *right* choice for any voltage or current measurement and recording job is a Bristol Series 500 instrument.

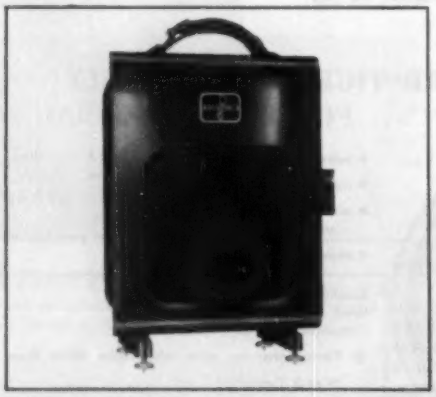
Why Bristol? Mainly because for sheer accuracy the Bristol Recorders can't be topped. Among the reasons for that are:

1. Low burden – the lowest burden of any round-chart recorder on the market.
2. Extremely high torque gradient.
3. Temperature compensated.
4. Shock-proof moving element mounting.
5. Leveling of instrument not critical.
6. Continuously legible recording of sudden changes – up to full scale value.

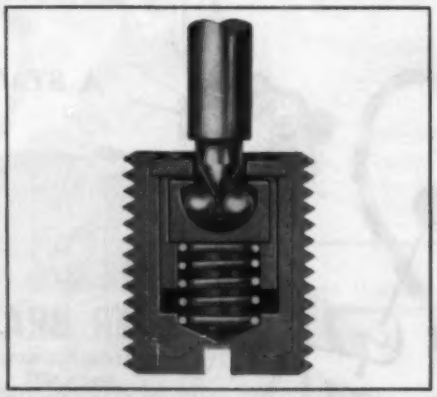
Also, Bristol's Series 500 Voltmeters and Ammeters are designed for easy use, with dust- and moisture-proof cases; quick-set chart hub for each chart changing; and snap-on chart plate.

Models offered that comply with ASA Specification C39.2.

Want more facts? Write for Bulletin E1111 to the Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 5.19



SINGLE AND TWO-PEN PORTABLE BRISTOL RECORDERS are offered in two models: one chiefly for portable pole mounting and the other for general portable service.



NEW BALL-BEARING SUSPENSION, loaded by a coil spring, prevents damage even under severe mechanical shock. Corrosion-resistant stainless steel ball bearings are almost tool-hard.

BRISTOL'S

BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Ring is cut away as reminder to linemen that he should break the link before opening the cutout.

Complete hook-stick removal and replacement of cartridge. Available in 5.2 kv, 7.8 kv, and 15kv voltage ratings.

Easy pulling action of interchangeable load-break cartridge will break link inside tube, and arc is cleared before tube can drop.

Less than 30 lbs. pull to break the largest size link . . .

Interchangeable Load-Break Cartridge Now Available for L-M's HDO Open-Type Cutouts

Load current is extinguished in the tube. Load-break interrupts all capacitive and inductive loads up through 100 amperes. Fault interrupting capacity 10,000 amperes, 5.2 kv, 7.8 kv, and 8,000 amperes, 15 kv.

By **GEORGE W. COOPER,**
Product Manager
Protective and
Switching Equipment
Line Material Company

L-M's big, rugged 100-ampere HDO open-type cutouts with the new interchangeable load-break cartridges provide outstanding operating and design features that assure you of lasting performance and easy operation.

The load-break cartridge utilizes standard 20-inch distribution fuse links. All links through 100 amperes can easily be broken because of the high mechanical advantage of the link-break lever.

A pulling action of less than 30 pounds is required to break the largest size link. The cartridge is designed to insure a complete break of the fuse link and the complete extinguishing of load current in the tube.

The upper pull ring has been cut away to remind the lineman of the link-break feature. This eliminates the danger of pulling open the cutout, through force of habit, without first breaking the link. If, on second thought, it is deemed desirable to open the cutout without breaking the link, this can be done by engaging the hook stick behind the cartridge.

Principal Features of L-M's 100 Amp HDO Open-Type Cutouts

The HDO incorporates many desirable features, assuring positive action and dependable service. These include:

Completely bird-proof construction.

Corrosion-resistant, high-strength hardware, with 4 to 6 times the life of mild steel.

Current-carrying parts all silver-plated brass or copper.

Cartridge firmly anchored for closing-in on faults; tube cannot move upward; cannot pop out of bottom hinges in closing.

All cartridges designed for complete hook-stick removal and replacement.

Maximum interrupting capacities with any size link. Cutout interrupts any fault current from minimum melting of link to maximum cutout rating.

Tin-plated connectors mounted directly on stationary contacts eliminate several current-interchange points.

Tube cannot miss top contacts, which are heavy silver-plated springs. These make a high-pressure contact with the cartridge.

Positive pressure-controlled expendable cap.

Exclusive wedge-type clamping jaw positively prevents link slippage. Jaw teeth firmly grip link leader—the harder the pull, the tighter the grip.

The complete line includes cutouts in the 5.2, 7.8, and 15 kv classes with a full line of conventional and load-break cartridges in standard and heavy duty interrupting ratings, and a 200 ampere switch blade.

Get Complete Information

Ask the L-M Field Engineer for complete information about L-M's complete line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

210

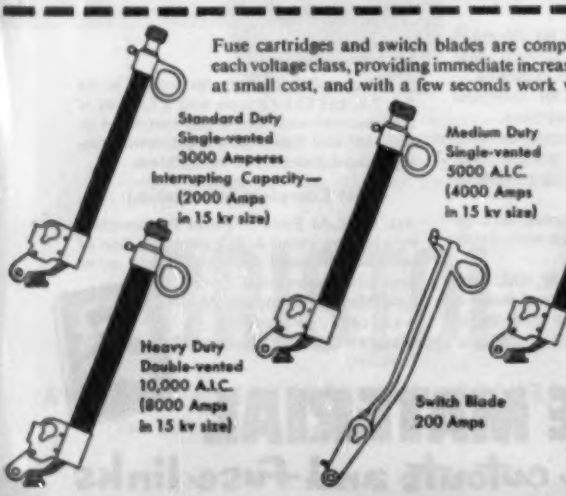
LINE MATERIAL
fuse cutouts and fuse links

Bird-proof
Corrosion-resistant hardware
Direct connections cut number of current-interchange points
Silver-plated copper or brass current-carrying parts
High-pressure contacts
Tube cannot miss top contacts
Interchangeable tubes—all take standard 20-inch fuse links
Standard EEI-NEMA hanger; angle or vertical mounting
Bird-proof
Hook-stick removal and replacement
Shunt contact
Hinge anchor
Direct connections cut number of current-interchange points

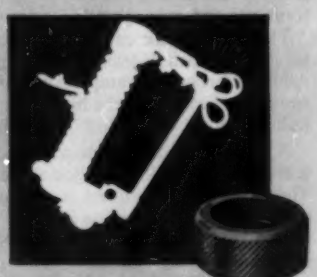
Standard mounting available in all three voltage classes. Top contacts and center hanger mounting are through-bolts with insulated heads. These keep the porcelain under compression, providing added strength and a completely bird-proof design.

On Low Amperage Faults single venting, at bottom only, provides ample pressure to expel the arc and the fuse link, before the tube drops down. In cases of low amperage faults, only the fuse link needs to be replaced. On high interrupting capacity cutouts, the expendable cap, above, right, remains intact, the same as the solid cap.

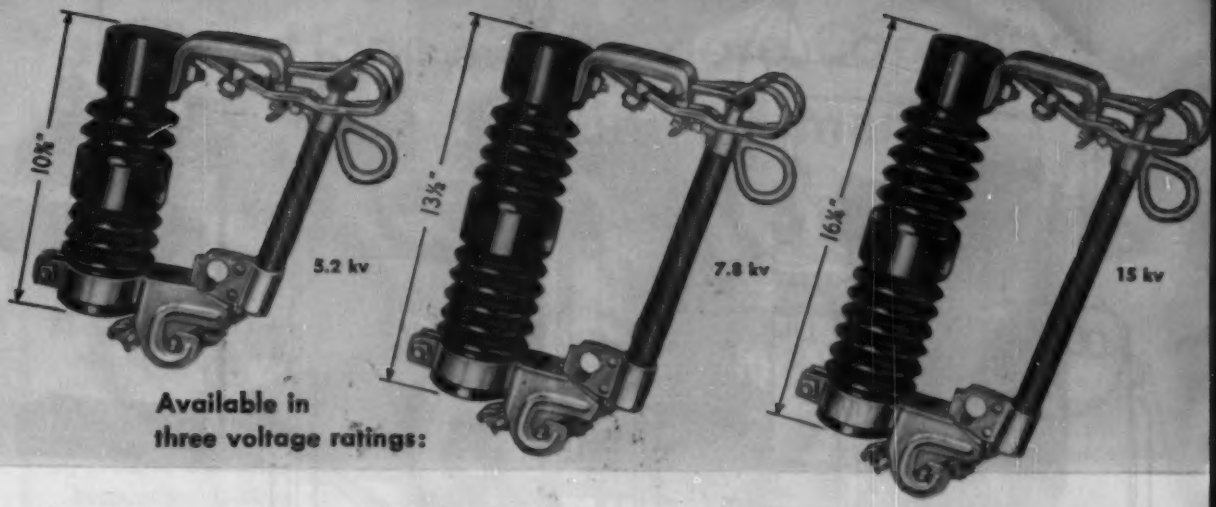
Fuse cartridges and switch blades are completely interchangeable in each voltage class, providing immediate increase in interrupting capacity at small cost, and with a few seconds work with a hook-stick.


Standard Duty Single-vented 3000 Amperes Interrupting Capacity—(2000 Amps in 15 kv size)
Medium Duty Single-vented 5000 A.I.C. (4000 Amps in 15 kv size)
Medium Duty Double-vented 6000 A.I.C. (4000 Amps in 15 kv size)
Heavy Duty Double-vented 10,000 A.I.C. (8000 Amps in 15 kv size)
Switch Blade 200 Amps

Interchangeable load-break cartridges are available for each voltage class cutout. Easy pulling action breaks link inside tube, and arc is cleared before tube can drop.



On High Amperage Faults pressure opens expendable cap at top. Tubes don't burst. No gas flashover, because no cutout parts are in path of gas discharge.



Available in three voltage ratings:

L-M's New "HDO" Open-Type Cutouts... The Cutout Development Of The Year!

New "HDO" 100-ampere cutouts are the simplest, most rugged, easiest to operate in the industry today. Provide high interrupting capacity, bird-proof design; heavy construction, assuring economy.

By R. W. KELLY
Application Engineer
Protective and Switching Equipment Division
Line Material Company

Here's a big new development in open-type cutouts that offers you a tremendous improvement in performance, operation, and economical long life.

The "HDO" is a big, rugged cutout. It is strong, durable. It's the easiest cutout to operate you ever saw. Complete hook-stick removal and replacement of cartridges. Bird-proof construction. Silvered current-carrying parts with few current-interchange points assure ample capacity without overheating. And it operates equally well on high and low fault currents.

Positive Pressure Control

A feature of the "HDO" is L-M's exclusive pressure-controlled expendable cap. On low faults the pressure is confined, assuring consistent, reliable arc interruption. On high faults the diaphragm in the cap opens, relieving the pressure by providing double venting.

Complete Line of Cutouts

Prices for the "HDO" cutouts are extremely reasonable, and the interchangeability feature offers desirable future economies. The complete line includes cutouts in the 5.2, 7.8, and 15 kv classes, with a full line of cartridges in standard- and heavy-duty interrupting ratings, and a 200-ampere switch blade. All cartridges take standard 20-inch distribution fuse links.

Protection That Is Reliable

The many desirable features incorporated in L-M's "HDO" open-type cutout assure positive action, dependable service.

Completely bird-proof construction.

Current-carrying parts all silver-plated brass or copper; this prevents false outages caused by contact heating even after many years of operation.

Cartridge firmly anchored for closing-in on faults; tube cannot move upward; cannot pop out of bottom hinges in closing.

All cartridges are designed for complete removal and replacement with a standard hook-stick.

Maximum interrupting capacities with any size link. Cutout interrupts any fault current from minimum melting of link to maximum cutout rating.

Connectors mounted directly on stationary contacts eliminate several current-interchange points.

Tube cannot miss top contacts, which are heavy silver-plated springs and designed to serve as a guide.

Corrosion-resistant, high-strength hardware has four to six times the life of mild steel.

Get Complete Information

Ask the LM Field Engineer for complete information about L-M's complete line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

SIZES AND RATINGS

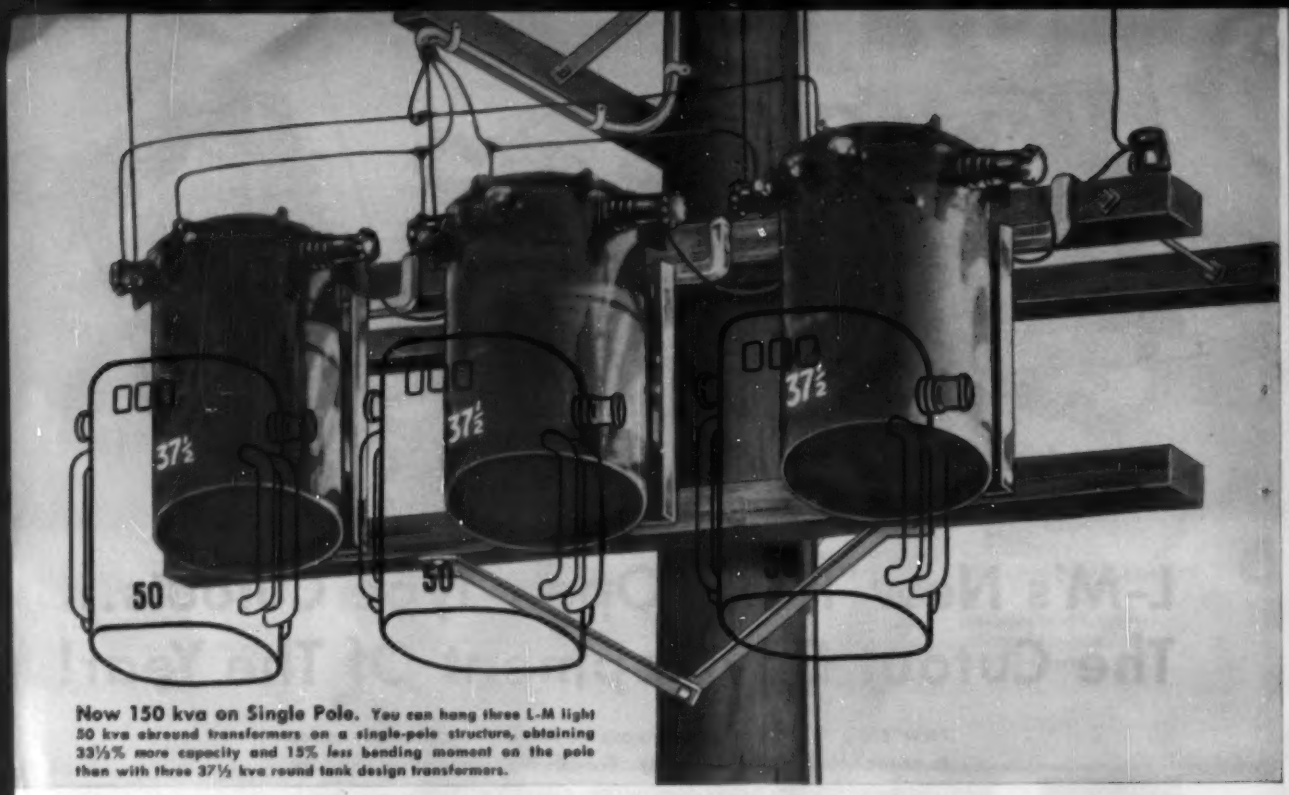
Cartridges	Interrupting Capacity, Amperes 5.2 kv.	7.8 kv	15 kv
Standard Duty Single Venting (Solid Cap)	3000 A.	3000 A.	2000 A.
Medium Duty Single Venting (Solid Cap)	5000	5000	4000
Medium Duty Double Venting (Expendable Cap)	6000	6000	4000
Heavy Duty Double Venting (Expendable Cap)	10,000	10,000	8000
Switch Blade	200 amperes continuous		

All cartridges and switch blades interchangeable in each voltage class.

LINE MATERIAL

fuse cutouts and fuse links

204-R2



Now 150 kva on Single Pole. You can hang three L-M light 50 kva obround transformers on a single-pole structure, obtaining 33⅓% more capacity and 15% less bending moment on the pole than with three 37½ kva round tank design transformers.

How L-M Obround Design Provides Additional Capacity On Structures

New obround tank design is smaller, lighter, has shorter moment arm, retaining all outstanding Round-Wound® performance characteristics.

By **ALVIN B. COYLE**
Manager
Transformer Sales
Line Material Company

Now you can hang transformers of larger capacity on a pole structure with L-M's lighter, smaller obround transformer tank design. The additional capacity is obtained without changing outstanding performance characteristics of L-M's Round-Wound design.

Less Weight

The obround design provides a smaller tank with less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where necessary to provide the cooling surface for maintaining the same low hot-spot and top oil temperature-performance characteristics found in all other L-M transformers. In addition, the transformer's repetitive overload capacity is improved as the result of the faster transfer of heat from the coils to the cooling air.

Shorter Moment Arm

L-M's new obround design brings the center of gravity closer to the pole, which reduces the moment arm distance from the pole. The combination of lighter weight and less moment arm distance substantially decreases the total bending moment on the pole and crossarms, and thus greatly increases the potential capacity of all your transformer structures.

You can take advantage of savings such as these:

Larger transformers can be hung closer to the top of the pole, eliminating the need for a higher pole and additional spacing.

Single-pole, three-phase transformer structures can now serve more load with the additional transformer capacity available. New 50 kva obround transformers have less bending moment on the pole and on crossarms than previous 37½ kva round tank design. Here L-M's light obround transformers may eliminate the need for costly two-pole structures.

Pole-Mounted 167 kva Transformers

L-M's light-weight 167 kva transformer can be pole-mounted; provides a full 167 kva of capacity on a single-pole structure. And it, too, provides L-M's well-known overload capacity.

To serve three-phase loads you can hang three L-M light 167 kva transformers or 500 kva on a two-pole structure, eliminate expensive platforms, ground pads, or vaults in many instances, and make further use of existing facilities.

L-M's light, obround design transformers are available in single-phase 5 kva through 167 kva in each standard distribution voltage class.

Get Details On Lighter-Weight Obround Transformers

Ask the L-M Field Engineer for application information, weights and dimensions on L-M obround transformers and the exclusive Round-Wound design. Or write Mr. Coyle at Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

LM® LINE MATERIAL Transformers

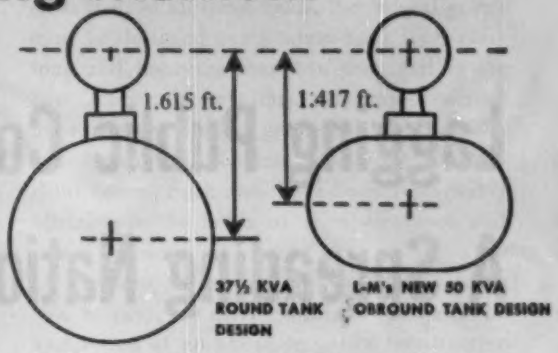
You Can Hang 33⅓% More Capacity With 15% Less Bending Moment

COMPARE 37½ kva round tank design
50 kva L-M obround tank design

37½ kva ROUND tank design:
Moment arm from center of pole. 1.615 ft.
Weight. . . . . 800 lbs.
Bending moment 800 x 1.615. . . . **1292 ft.-lbs.**

50 kva L-M OBROUND tank design:
Moment arm from center of pole. 1.417 ft.
Weight. . . . . 775 lbs.
Bending moment 775 x 1.417. . . . **1098 ft.-lbs.**

L-M's new 50 kva obround transformer has 15% less bending moment than the 37½ kva round tank design.



Less Bending Moment—New obround tank design reduces the moment arm distance from the pole. The combination of lighter weight and smaller moment arm distance greatly decreases the total bending moment on the pole. When crossarm mounted, the lighter weight substantially reduces the bending moment on the crossarms.

Less Weight, Faster Cooling—The obround design affords a small tank and less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where required to provide sufficient cooling surface.

In addition, oil ducts, located throughout the coil and between the coil and cruciform cross-section of the wound core, contribute to uniform efficient cooling.

Rapid transfer of heat provides faster cooling of the unit, increasing its repetitive overload capacity.

Plus Outstanding Round-Wound Performance Characteristics

Both the physical and performance characteristics of L-M's obround tank transformer were considered in detail. The advantages of lighter weight and shorter moment arm were accomplished with no sacrifice of outstanding Round-Wound performance characteristics.

Low Exciting Current: the continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.

High Impulse Strength: high-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage windings and the core. This permits ample creepage distance with generous insulation.

High Short-Circuit Strength: round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking aid in preventing axial movement of the windings under short-circuit conditions.

High Short-Time Overload Capacity: cruciform cross section of wound core and ducts between windings and layers provide excellent cooling for the entire unit.

Now you can hang 167 kva directly on the pole, yet L-M's new lightweight obround has full 167 kva continuous rating and no sacrifice in overload capacity.

LINE MATERIAL
LM Transformers

2198

Lagging Public Construction — A Spreading National Blight

The most recent editorial in this series dealt with the plans of American industry for expanding and modernizing its plant and equipment over the next four years. These plans call for the expenditure of $113 billion over that period. There is a good prospect that the money to carry them out will be available. If the plans are carried out, manufacturing capacity at the end of 1958 will be double that which existed at the end of World War II. And this industrial plant will be modernized.

In sharp contrast to this picture is the condition of our *public* plant and equipment — the roads, schools, water supply, health and sanitation facilities upon which industry, as well as the average family, depends. **According to a recent estimate by the Twentieth Century Fund, the people of the United States must spend almost $100 billion on new public works projects during the next five years merely to meet the minimum needs of our growing economy.**

Other estimates by the President's Council of Economic Advisers, by state agencies and by private construction economists all show the same condition: a staggering need for public works. Yet no steps have been taken that even offer a promise of closing the gap between the public facilities we are building and the greater facilities we really need.

How did we come to let our public facilities fall into this sorry state? Here are some of the reasons:

(1) During the years of depression and war, from 1930 to 1945, these facilities were neglected. New construction declined, and even maintenance was cut.

(2) Since the end of World War II, increased construction costs have made it difficult for communities to get the needed construction with the funds budgeted in the past for that purpose.

(3) The great postwar upsurge in population, and the spreading of our population into new areas, has created a huge demand for additional community facilities before the neglect of earlier years could be made up.

Responsibility Divided

Now the need for more public construction has become apparent to everyone, on jammed highways and in over-crowded schools. But, unfortunately, the responsibility for doing something about this situation cannot be so clearly fixed as can the responsibility for maintaining industrial facilities. A business firm must expand its capacity when markets are growing or lose its trade position. It must modernize its plant and equipment or be undersold by more efficient competitors. In the case of public facil-

ities, there is no such competitive incentive. To be sure, a city or state may lose population and industries if its public facilities are inadequate. But such shifts are very slow to take place and difficult to relate to any specific public program, or lack of it.

Moreover, the responsibility for constructing public facilities is divided between state and local governments and federal authorities. Within each of these governmental units there are specialized bureaus or departments with varying responsibilities. This division of responsibility obviously adds an element of difficulty to the development of an adequate program of public construction.

Breaking the Log-Jam

How can this administrative log-jam be broken and the financial difficulties overcome?

One course would be to have the federal government step in with a nation-wide new program of direct spending on public works. That would utilize the resources of the federal treasury for immediate action. But there are weighty objections to such extensive federal participation. One is that federal spending cannot be greatly enlarged without a corresponding increase in the federal control of decisions that normally have been left to local communities. Another objection is based on the fact that so long as we must maintain a large defense establishment, such an addition to federal spending means either higher taxes or a chronically unbalanced budget.

The other course is to rely primarily on local initiative, but with new and more effective federal aid to local governments. Such aid would help speed up planning and construction, and contribute toward a solution of the most burdensome financing problems, but in amounts sufficiently limited to require that most of the capital be raised locally.

No Single Formula

No one formula can be applied to make such aid effective. The raising of funds for new schools, for example, involves problems very different from those of financing highways, or water-works, or hospitals. But it does seem clear that, in all these fields, the federal grants must be designed to stimulate more local planning and financing than has prevailed in the past. Among the new ideas that may offer such incentives are federal grants for planning and initial costs and federal guarantees of local bond issues. Such aids have been remarkably effective in the fields of slum clearance and public housing.

While the federal government clearly has a role to play, we cannot afford to postpone inauguration of an adequate public construction program while we seek a formula to apportion governmental participation that would be generally accepted as ideal. Every year about 2½ million more Americans are putting increasing pressure on a public plant already dilapidated and inadequate. The result is an increasing menace to comfort, health, education and safety. It is also an increasing menace to the effective performance of American industry.

The appropriate public response to this situation is a driving public determination to eliminate this increasingly dangerous lag in public construction. At this juncture, the development of such a determination is basic. Nothing stands in the way of an adequate program of public construction that a determined electorate cannot remove.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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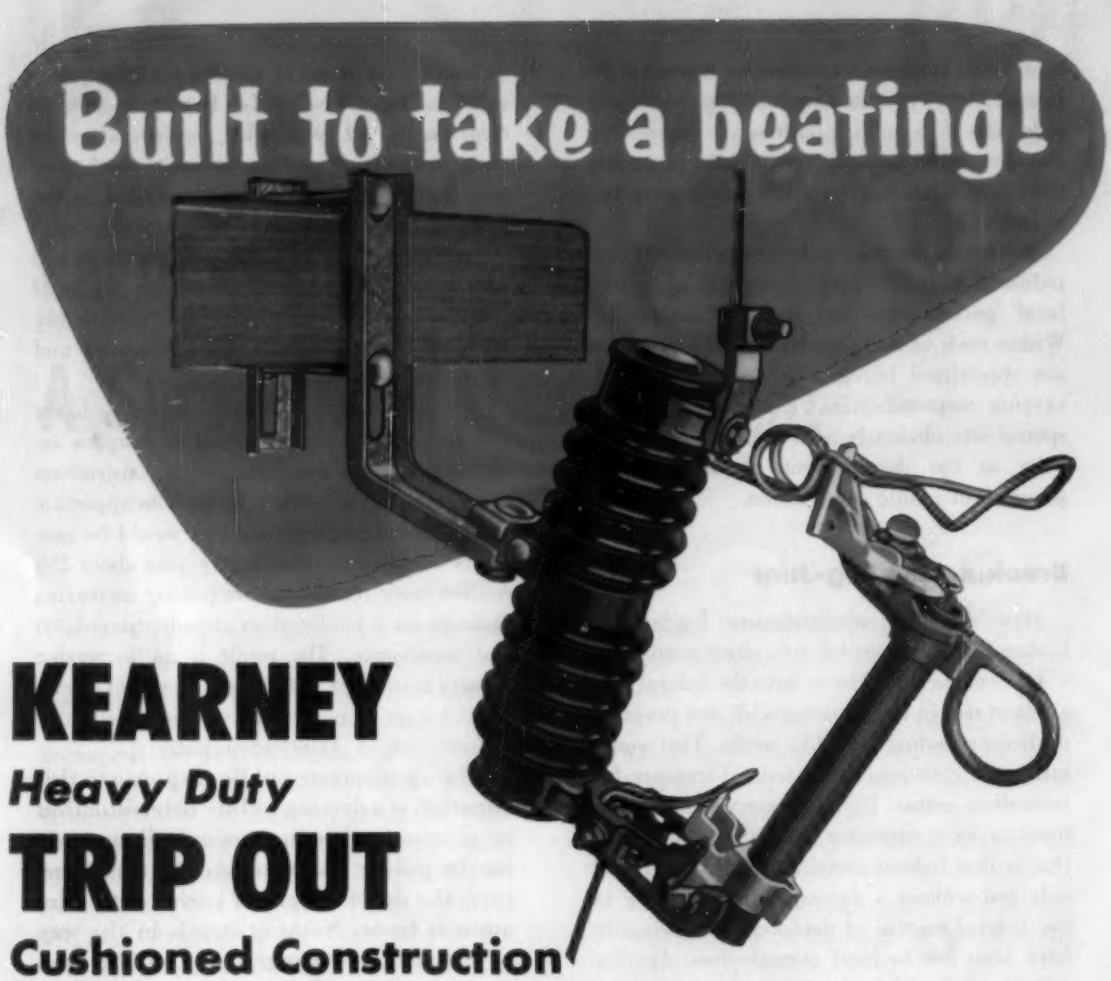
Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

Built to take a beating!



KEARNEY

Heavy Duty

TRIP OUT

Cushioned Construction Prevents Insulator Breakage

Here's how an extra margin of reliability is built into every Kearney Trip Out fuse cutout. Exclusive *cushioned construction* prevents cartridge recoil from breaking the insulator. The spring-type upper contact arms absorb the jolt of high-current fault expulsion gases. In addition, the full double venting of the heavy duty Trip Out greatly reduces cartridge recoil.

Massive construction provides reserve thermal capacity to keep the Kearney Trip Out operating at low temperature . . . even after repeated overloads, contaminated air weathering and years of service. Contact burning is prevented by the toggle hinge that delays separation until the arc is extinguished in the fuse tube.

279

For Better Construction . . . Safer Maintenance

JAMES R. KEARNEY

Specify KEARNEY PRODUCTS

The Mark of Quality

JAMES R. KEARNEY CORPORATION • 4234-42 CLAYTON AVENUE, ST. LOUIS 10, MISSOURI • Canadian Plant: GUELPH, ONTARIO

Twenty years under the sun

RUBBER-JACKETED CABLE *(left)*, NEOPRENE *(right)*. Unretouched close-ups show condition of jackets after 20 years' exposure.

—and NEOPRENE cable jacket is still in good condition!

In January 1935, two samples of cable, one with an ordinary rubber jacket, the other with a jacket of neoprene, were placed in an outdoor proving ground. After 20 years of continuous exposure to sun and weather, the natural rubber jacket is badly deteriorated and cracked. The neoprene jacket, on the other hand, is still lively, tough, and as free from cracks as it was two decades ago.

The samples shown here are bent in an arc to put stress on the jackets. This is a standard method of test to show the results of oxidation . . . one of the major causes of failure in rubber materials exposed to sunlight and weathering. Neoprene's inherent resistance to oxidation has made it the outstanding choice for jacket material on wire and cable.

Long-term tests like this prove you can depend on neoprene to give superior protection throughout an extra-long service life. Neoprene resists deteriorating influences no ordinary resilient material could stand. So when you buy wire or cable, make sure it's made to stay on the job . . . make sure it's jacketed with neoprene, Du Pont's chemical rubber.

Remember, of all resilient materials, only neoprene has *balanced resistance* to:

- Sunlight and weathering
- Oils, solvents, most chemicals
- Electrolytic attack
- Heat
- Corrosive atmospheres
- Flex cracking
- Abrasion, cutting, chipping
- Oxidation and aging

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

MAIL THIS COUPON TODAY!

FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip this coupon to get on the mailing list.

E. I. du Pont de Nemours & Co. (Inc.), Elastomers Division EW-6
Wilmington 98, Delaware

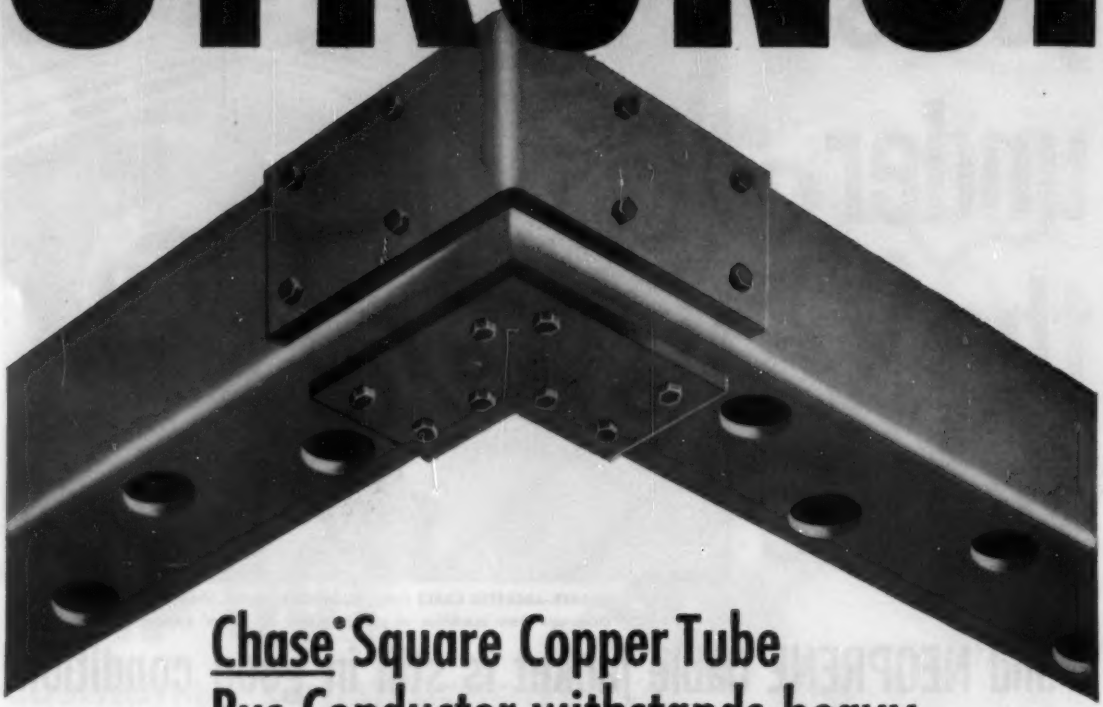
*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

STRONG!



Chase® Square Copper Tube Bus Conductor withstands heavy short circuit stresses, minimizes sag!

The square cross section configuration of Chase Ventilated Square Copper Tube Bus Conductor gives it the extra strength needed to withstand the stress of heavy short circuits . . . to permit longer spans between supports!

The heat-dissipating vent holes in Chase Bus Conductor that increase current-carrying capacity up to 20% *also* save you as much as *36%* in weight of copper in comparison with flat rectangular bus bar!

For full information about Chase Ventilated Square Copper Tube Bus Conductor, send for the free Chase Bus Conductor Brochure.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

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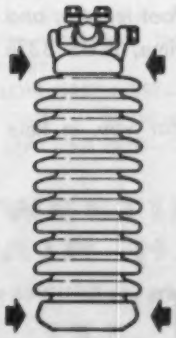
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(Sales office only)

LAPP CLAMP-TOP LINE POST

Easy to install...
Easy to change...
Secure in operation

For original installation, the Lapp Clamp-Top Line Post, with clamp attached, is mounted (stud bolts of any length are interchangeable). Keeper cap screws are loosened, and one removed. Keeper is rotated out of position, conductor dropped in, keeper and cap screw replaced, and both screws tightened. Cap screws have captive washers—there's *only one loose part* per insulator throughout installation.

To change out an insulator, the trunnion screw is backed off (not removed). Clamp stays on the conductor and is slipped back into position in new insulator. All clamps are interchangeable in all sizes of Lapp Clamp-Top Line Posts. Line can be reinsulated for higher voltage with ordinary hot line tools with greatest convenience.



All Lapp Post insulators are built with hardware *externally* attached. Cracking is prevented because thermal movement or mechanical strains can load porcelain only in compression. This provides an extra margin of operating security, assures long insulator life and low line upkeep.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

ANOTHER EXAMPLE OF Cope EFFICIENCY...

COPE 70,000 SERIES CABLE TROUGH WITH THE BUILT-IN COUPLER

now available in 12' length

33% fewer connections

The new Cope 70,000 Series Cable Trough with the built-in Coupler is now available in 8, 10, and *12 foot lengths,* and affords you 80% SAVINGS in assembly time, PLUS 33% FEWER CONNECTIONS.

These features alone mean real savings for you, in time and money.

*PATENT PENDING

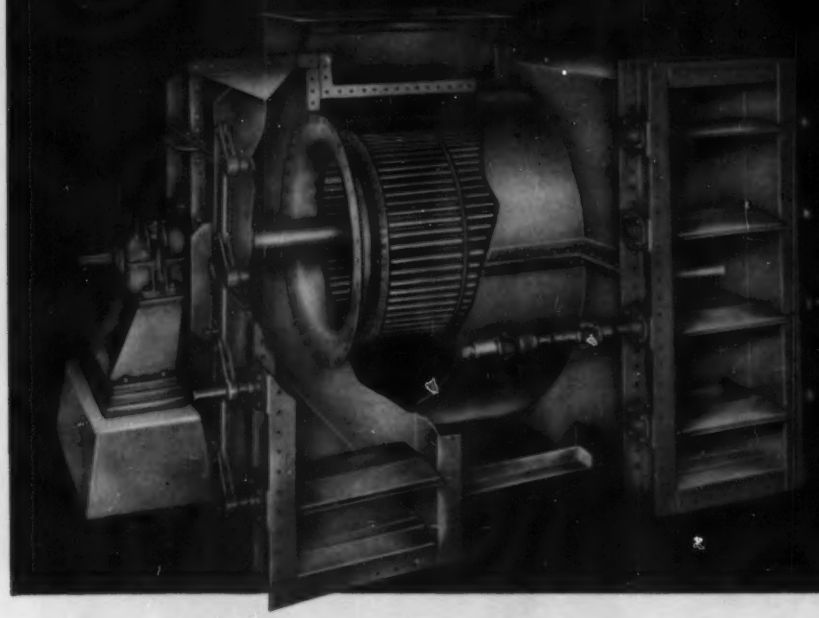
Cope

T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

Fact:

WESTINGHOUSE HEAVY DUTY INDUCED DRAFT FANS ARE ECONOMICAL . . . SAVE SPACE!



Inlet damper control saves horsepower at reduced loads by spinning entering gas in direction of wheel rotation.

The outstanding features of these Westinghouse-Sturtevant Heavy Duty Fans *with forwardly curved blading* offer the *best* combination, in public utilities and industrial plants, for both process steam and power generation.

1. **HIGH FAN EFFICIENCY**—Streamlined passages and improved blade proportions provide high fan efficiencies throughout normal operating range.
2. **LOW FIRST COST**—Less than any other conventional type for the same duty.
3. **SPACE SAVING**—Design permits handling large volumes of gas in relation to space occupied.
4. **LOW SPEEDS**—Operating speeds are lower than other conventional fan types.
5. **RUGGED**—Solidly built of welded reinforced steel plate and designed *specifically* for heavy duty induced draft service.

MORE FACTS? Call your nearest Westinghouse-Sturtevant specialist—he's the "Man with the Facts" on Mechanical Draft and other Air Handling applications, and Electronic Air Cleaning.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80436

Westinghouse Electric Corp.
Sturtevant Division, Dept. 12E
Hyde Park, Boston 36, Mass.

Please send more facts on your Induced Draft Fans.

NAME AND TITLE .....

COMPANY .....

CITY ..... STATE .....

The "small town" system that gives "big town" service

—in Michigan, Indiana, Ohio, Kentucky, West Virginia, Virginia, Tennessee

The American Gas and Electric System has frequently been called a "small town" system with a reputation for "big town" service. Few of the 2319 communities it serves exceed a population of 25,000. Yet, these towns make up a 7-state area that today is growing and thriving—an area that has all of the elements—natural and human resources for even greater future growth and development.

The American Gas and Electric System today is the largest privately owned producer of power in the nation. System facilities include the most modern and efficient generating plants in the world. "Economy from point of generation to point of use" is basic American Gas and Electric Company policy.

In seeking a new plant site, don't overlook the advantages of dependable low-cost power. Our Area Development Department can be of real help to you. Phone or write, *in confidence*, for our brochure "A 7-State Plant Site Trip in 5 Minutes."

AMERICAN GAS AND ELECTRIC COMPANY
30 CHURCH STREET, NEW YORK 8, N.Y.

OPERATING AFFILIATES: Appalachian Electric Power Company • Indiana & Michigan Electric Company • Kentucky Power Company • Kingsport Utilities, Inc. • Ohio Power Company • Wheeling Electric Company

Delivers 33,962 Amperes to The Timken Company

For Specialized Steel Production

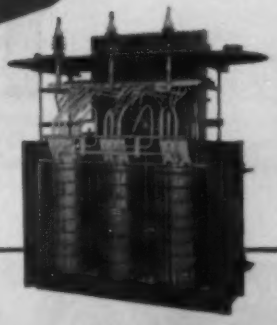
This is one of three arc furnace transformers built by Allis-Chalmers for The Timken Roller Bearing Company, Canton, Ohio, plant.

The repeated daily short circuits encountered in arc furnace operation require exceptionally rugged transformers that can provide reliability over long periods. That's one reason Allis-Chalmers furnace transformers are chosen for jobs like this. They have served many furnaces for as much as 25 to 30 years.

Design Features

Extremely heavy supports brace the coils against short circuit stresses in these transformers. Skillful insulation techniques protect windings from overvoltages due to wide tap range. Some of these transformers have been built with a range of operating voltages of several times the minimum secondary voltage.

The tap changer has specially designed contacts to provide for long life regardless of numerous daily tap changes. The mechanism is located in a separate compartment to facilitate inspection. It can either be motor driven or manually operated or both.



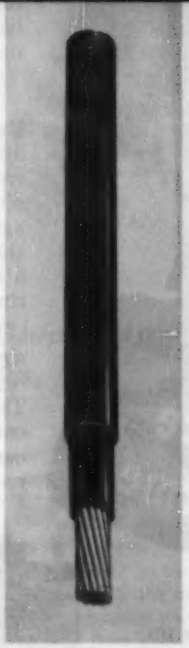
Rugged Core and Coil Assembly design is based on Allis-Chalmers more than 45 years' experience building arc furnace transformers. Unit must withstand repeated short circuits.

Complete Line of Arc Furnace Equipment

In addition to furnace transformers in ratings up to the largest demanded by expanding arc furnace operation, Allis-Chalmers also builds electrical control, circuit breakers, and auxiliary transformers. Next time you need new or replacement arc furnace electrical equipment, consult the Allis-Chalmers office nearest you or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4730

ALLIS-CHALMERS

For rural electrification, RoMarine-RoPrene serves as the service entrance, as well as branch circuits between buildings.

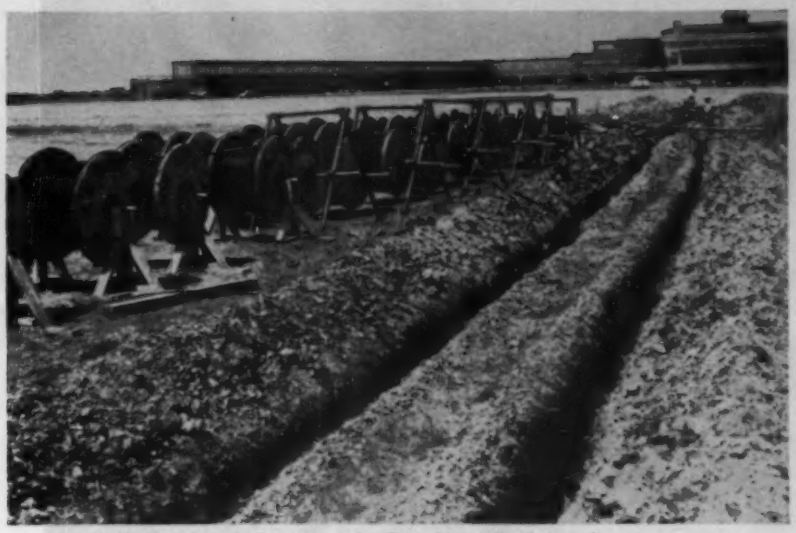


RoMarine-RoPrene's light weight and smaller diameters make it ideal for trays, racks and other metal raceway installations.

You can cut cable

RoMarine-RoPrene is easy to pull in manholes and conduit or duct runs.

Full-Color Movie Tells Dramatic Story of Cable • CABLE PATHWAY OF POWER. A 45-minute feature film in sound and color, 16mm. Now available for showings to technical personnel. Write Rome Cable Corporation, Rome, New York, for bookings.



RoMarine-RoPrene is all-resistant to the effects of burial directly in earth, as in the case of this Fort Worth, Texas, International Airport installation.

costs with this *premium* cable

Yes, it is true that in the long run it often costs less to buy the best. RoMarine-RoPrene power distribution cable proves it. It has an enviable performance record. In construction, it combines high quality RoMarine, heat- and moisture-resistant rubber insulation, with the ruggedness of RoPrene (Neoprene) sheath. Economy results not only from its dependability but from its versatility, as well. RoMarine-RoPrene is one cable that can be installed aerially, in ducts and conduits, buried directly in earth or in runs combining all three. Widely accepted for power-distribution circuits, there are many instances where it becomes a money-saving building wire. It costs but little more than the cheapest . . . yet more than makes up the difference with long life and electrical stability.

How you save

Compared with cables having metallic coverings, RoMarine-RoPrene makes these economies possible:

- Lower original purchase cost
- Savings through reduced inventory
- Lower replacement costs
- Less termination and splicing expense with fewer accessories.

You get these advantages:

- Exceptionally long service life
- Ease of terminating and splicing
- Light weight and smaller diameters
- No fibrous or other coverings to deteriorate
- Immunity to the effects of electrolysis, corrosion and temperature extremes
- High resistance to oils, acids, alkalies, moisture, abrasion, flame and weather.

Where you can use RoMarine-RoPrene

Generally recommended for 600-volt service, RoMarine-RoPrene is ideal for a multiplicity of applications by electrical utilities, in industrial plants, for rural electrification, airport wiring and residential services.

It is specifically approved by Underwriters' Laboratories, Inc. as Type USE for underground service entrances.

It is approved by Civil Aeronautics Administration for airport wiring, when CAA Specification L-824, with Type A insulation, applies.

It has been proved a superior product for general purpose wiring and, except under circumstances of the National Electrical Code, can be unhesitatingly recommended for 75°C. operation.

It will pay you to check into the economy and serviceability of RoMarine-RoPrene power distribution cables. Detailed specifications and prices are yours for the asking. Write or phone today for Bulletin RR-2.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ALL TYPES...ANY CLASS FIRE!

Since different fire hazards require different types of fire extinguishers, PYRENE—C-O-TWO manufactures all types . . . the finest and most complete line on the market today.

When doing business with PYRENE—C-O-TWO, you receive unbiased advice on what is best for your particular fire hazards, whether class A, B or C. Also, there is a well-rounded sales engineering organization having nation-wide representation to render top quality service wherever you're located.

Don't take unnecessary chances . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts now!

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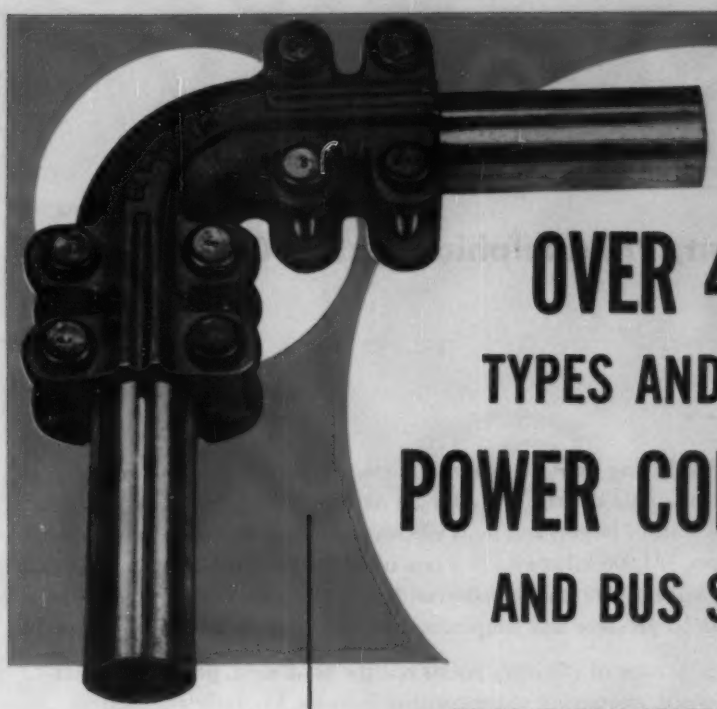
NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

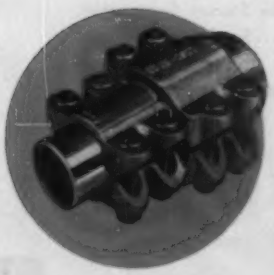
COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM



OVER 4,000
TYPES AND SIZES OF
POWER CONNECTORS
AND BUS SUPPORTS



IN SOUTHERN STATES' COMPLETE LINE

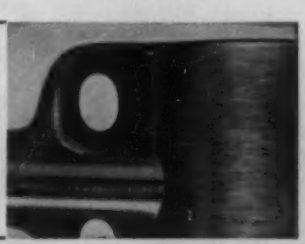
To meet the widest range of requirements for power and grounding connectors, Southern States produces more than 4,000 different types and sizes—many on special order to customers' specifications.

Widespread use of self-supporting, rigid, tubular bus constructions in substations has increased the mechanical requirements of many connectors. That is why Southern States connectors have been re-designed during the past two years. They now have stronger ears and are 40 to 50% heavier.

When you specify and use Southern States connectors, you can be sure they are capable of: 1) serving as self-supporting members; 2) providing good electrical connection; 3) developing full strength of clamping bolts without visible distortion; 4) carrying current equal to the conductor without excessive temperature rise; 5) being installed with a minimum of effort and time.

Rough Ground for Best Possible Contact

Every Southern States connector is rough ground on all contact surfaces. This permits the connector to bite into the conductor, causing intimate metal to metal engagement at thousands of high-pressure contact points, thus providing a better junction and one that is sealed against corroding atmosphere.



SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

R.G. Rincliffe

President, Philadelphia Electric Company

Said...

"But such is the driving urge for progress among all members of our industry that today Philadelphia Electric is building a new generating station which will house the world's largest and most efficient turbine generator—a cross-compound unit—to produce *325,000* kilowatts, at a rate of *3450* kilowatt-hours per ton of coal. The heat rate will be *8000* Btu per kilowatt-hour . . . Steam will be used at the record high *super-critical* pressure and temperature of *5000* pounds and *1200* degrees! . . .

"This amazing increase of efficiency points out the hard, cold, proven fact that the investor-owned, tax-paying electric utility industry has fully accepted the responsibiltiy to conserve our nation's energy resources! Just suppose we had rested on our 1925 laurels and that we had not increased our efficiency. By 1965, only ten years hence, to supply the expected demand, we would be consuming coal at the astronomical rate of *1000 million* tons every year! But we have increased our efficiency! With super-critical performance, precisely the same tremendous output of electric power can be obtained from only one-third the coal! That, then, is the measure of our pledge to the people of this nation—our owners, our customers—to apply constantly, and unremittingly, our every effort towards more efficient power generation."

The new station referred to by Mr. Rincliffe will be built by Philadelphia Electric Company at Eddystone, Pa. The super-pressure boiler for this station will be a C-E Sulzer Monotube Steam Generator, designed and built by Combustion Engineering... Setting new world standards of *pressure, temperature, capacity* and *efficiency*, the Eddystone Station will be a major step forward in power progress.

E-120

COMBUSTION ENGINEERING

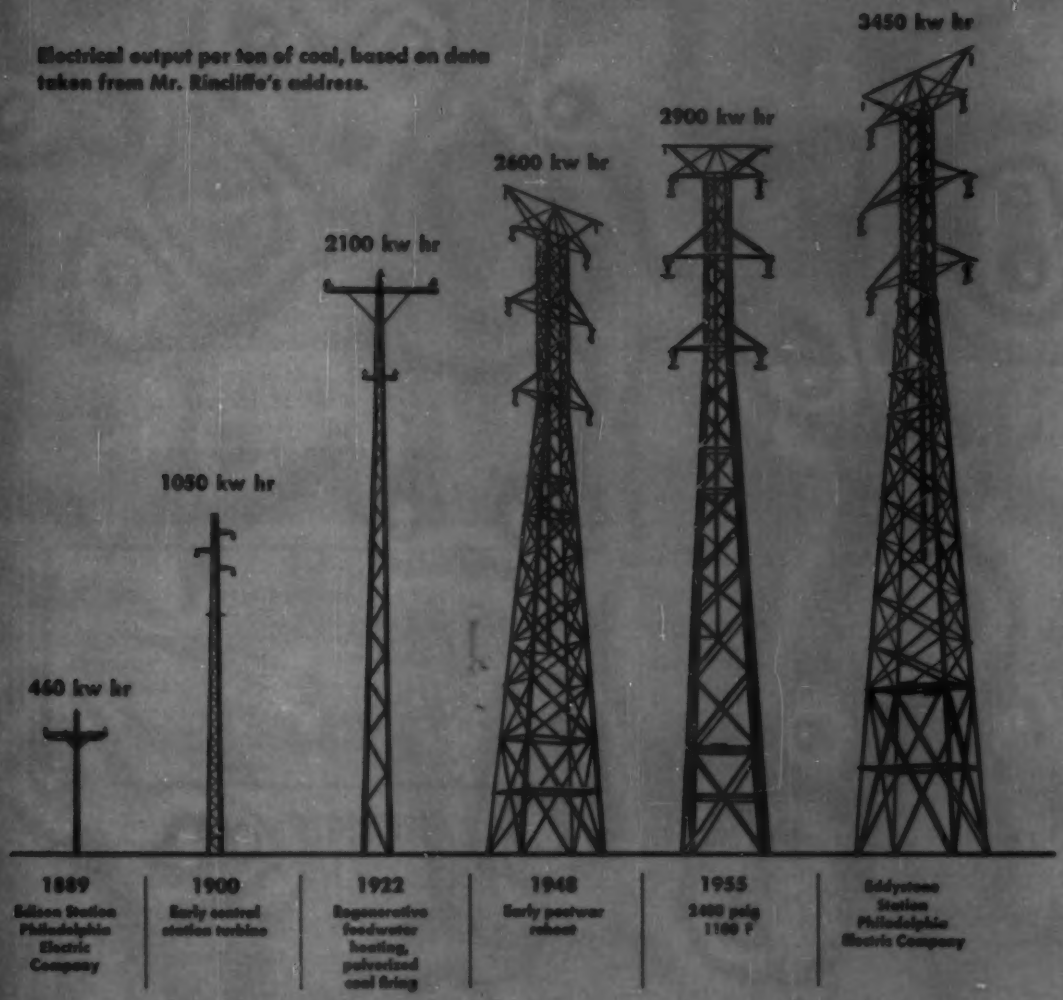
Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

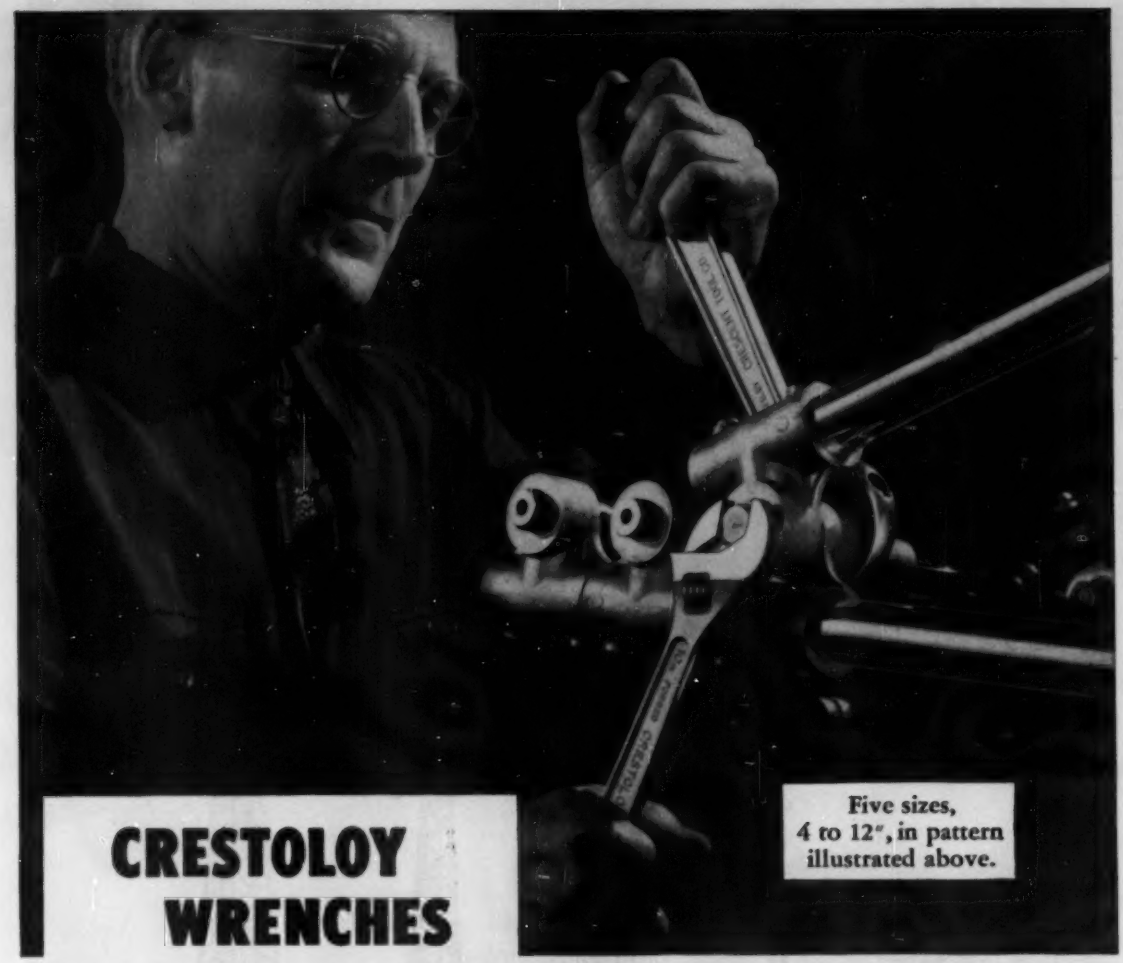
C-E

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOOT PUFF

at the E.E.I. Annual meeting

Milestones of American Power Progress





Five sizes,
4 to 12", in pattern
illustrated above.

CRESTOLOY WRENCHES

Forged from Crescent's own CRESTOLOY Steel, these fine wrenches are 200% stronger and 30% thinner than conventional adjustable wrenches. They are hardened by a selective induction process which guarantees longer life through a combination of surface hardness and interior toughness. Chrome plate finish. Sold by Industrial Distributors and Hardware Dealers everywhere.

DOUBLE END
Four sizes in 4-6", 6-8", 8-10", and 10-12" size combinations.

TAPERED HANDLE
Three heavy-duty sizes, 15", 18" and 24", have tapered handle as illustrated.

CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

This Regulator is Cover Suspended . . .

Easier to Inspect than any other

Routine inspections cost less both in time and manpower with Allis-Chalmers single-phase regulators. They are easier to inspect than any other regulator on the market. All components are cover suspended when untanking. All you do is remove a few cover bolts and control cabinet mounting bolts. Then just hoist up on the cover and the entire unit comes out of the tank. There is no oil to handle; no leads to break.

To check operation, just attach an external power source to the control leads. The regulator operates in normal fashion outside the tank as well as inside. There are no special connections to make.

Conveniences like these are the natural result of step regulator experience. No other manufacturer can match Allis-Chalmers 20 years of 5/8% step regulator experience. And no other 5/8% step regulator offers you so many years of solid proof of utility satisfaction.

For more information, consult the A-C office nearest you or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4769

It's easy to untank an Allis-Chalmers single-phase regulator with a truck crane, block and tackle, or with this more convenient inspection jack. Designed to help you take advantage of Allis-Chalmers unique cover-suspension feature, this jack can be used either on distribution regulators or single-phase power regulators. Jacks are available—see your nearby Allis-Chalmers office.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

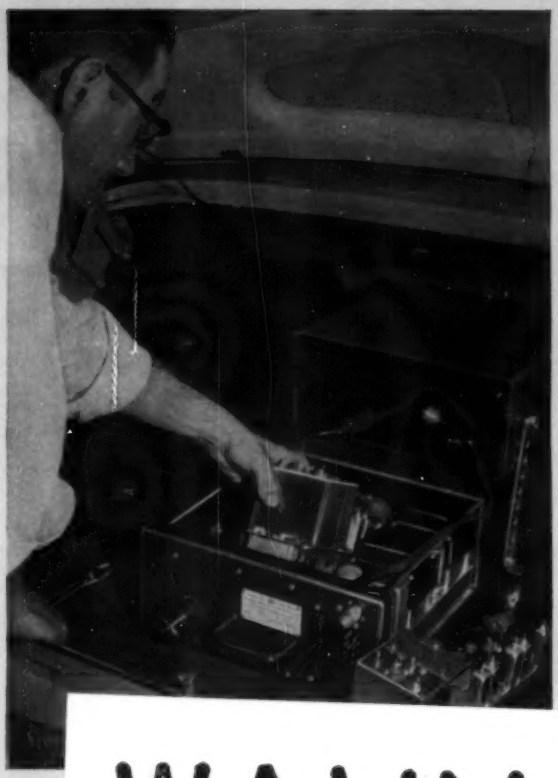
G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

NEW PROGRESS LINE saves money on maintenance through faster servicing—protects from obsolescence because chassis are quickly interchangeable.

IN the new Progress Line, transmitter, receiver, power supply and optional chassis are individually rack-mounted in a triple-rigid mobile case. Rapid interchangeability is provided by this rack construction and true plug-in chassis. This plug-in design permits changes in frequency, power, type of reception (narrow or wide band) quickly *at minimum cost, at any time.* You're free of any obsolescence risk!

You may switch Progress Line mobile units—whether front or trunk mount, between vehicles with 6 or 12 volt DC systems. No electrical alterations are needed. And any mobile combination can be converted quickly to a low-cost, 117 volt AC intermittent duty base station by changing only the power supply chassis!

Let a G-E Communications Counselor analyze your radio needs and develop an installation or conversion program planned for long-run savings. Write or call today for full specifications on the new PROGRESS LINE. *General Electric Company, Communication Equipment, Section X1965-27, Electronics Park, Syracuse, N.Y.*



INDIVI and re service or rec only a Electric Progress Line units also ability between mobile and station transmitters and receivers.

WAVY

◀ There is a G-E Authorized Service Station near you. Look for this sign.

EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

Progress Is Our Most Important Product

GENERAL ELECTRIC

KUHLMAN BALANCED DESIGN PROVIDES A COORDINATED CORRELATION OF ALL DISTRIBUTION TRANSFORMER COMPONENTS

CORE BALANCE (1)—The Bent Iron Core achieves the most desirable relation between the transformer, no load loss, and exciting current. It is the most efficient magnetic circuit in use today in distribution transformers.

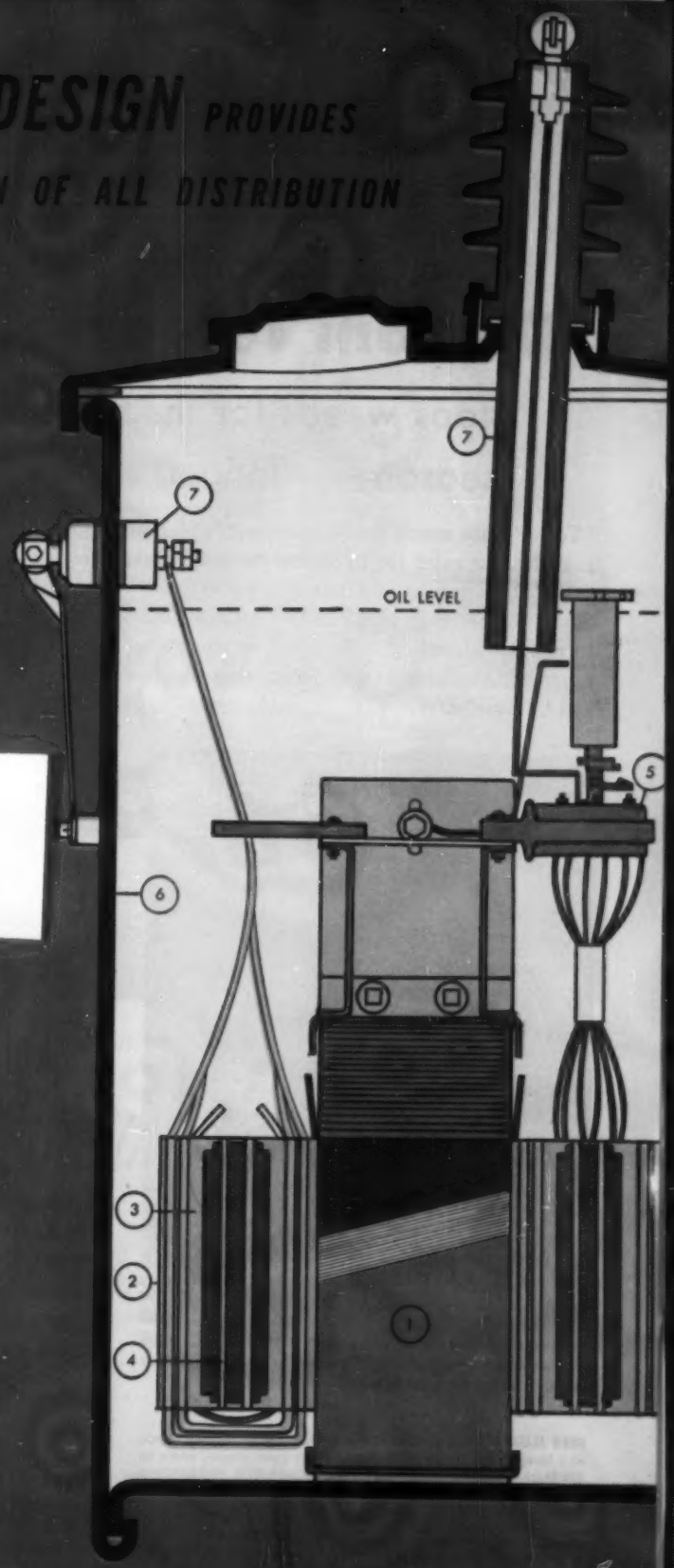
COIL BALANCE (2)—A core of minimum cross section permits a more efficient use of copper in the coil windings.

INSULATION BALANCE (3)—Insulation between the [illegible] and [illegible] adequate insulation strength.

TANK BALANCE (6)—The tank's two functions as a container and a heat dissipator are balanced to obtain adequate radiation with minimum overall dimensions.

BUSHING BALANCE (7)—Flash-over, creepage, and puncture strength are coordinated with winding insulation.

"Balanced Design" in Kuhlman Transformers results in balanced performance of high efficiency and low voltage regulation.



PAGES

KUHLMAN

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

G.E. DEVELOPS NEW PLUG-IN CHASSIS FOR 2-WAY RADIO

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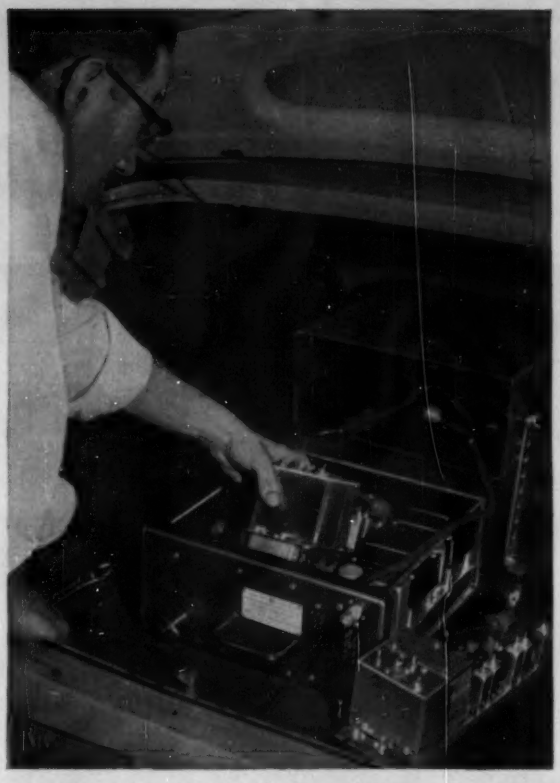

INDIVIDUAL PLUG-IN CHASSIS minimize capital investment in spares and reduce radio maintenance time! Your vehicles will be back "in service" faster. For instance, you can replace either a transmitter or receiver plug-in chassis right in the vehicle in 5 minutes—using only a screwdriver. Individual plug-in chassis of the new General Electric Progress Line units also provide complete interchangeability between mobile and station transmitters and receivers.

◀ There is a G-E Authorized Service Station near you. Look for this sign.

EASY FRONT MOUNTING under the dash. The new G-E Progress Line case is less than 15" deep. For the first time you can have a 90-watt front mount mobile unit in the 25-54 MC band and a 50-watt front mount mobile unit in the 144-174 MC band. In the 25-54 MC band you can now have simultaneous monitoring of 2 channels, in the same case, without additional equipment.

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INSULATION BALANCE (3)—Insulation between the turns, layers, and from windings to core and case are proportioned to the dielectric stresses encountered in service.

THERMAL BALANCE (4)—Coil structure makes efficient use of ducts and radiating surfaces for cool operation.

TAP CHANGER BALANCE (5)—Ease of operation and firm positive contacts are balanced against adequate insulation strength.

TANK BALANCE (6)—The tank's two functions as a container and a heat dissipator are balanced to obtain adequate radiation with minimum overall dimensions.

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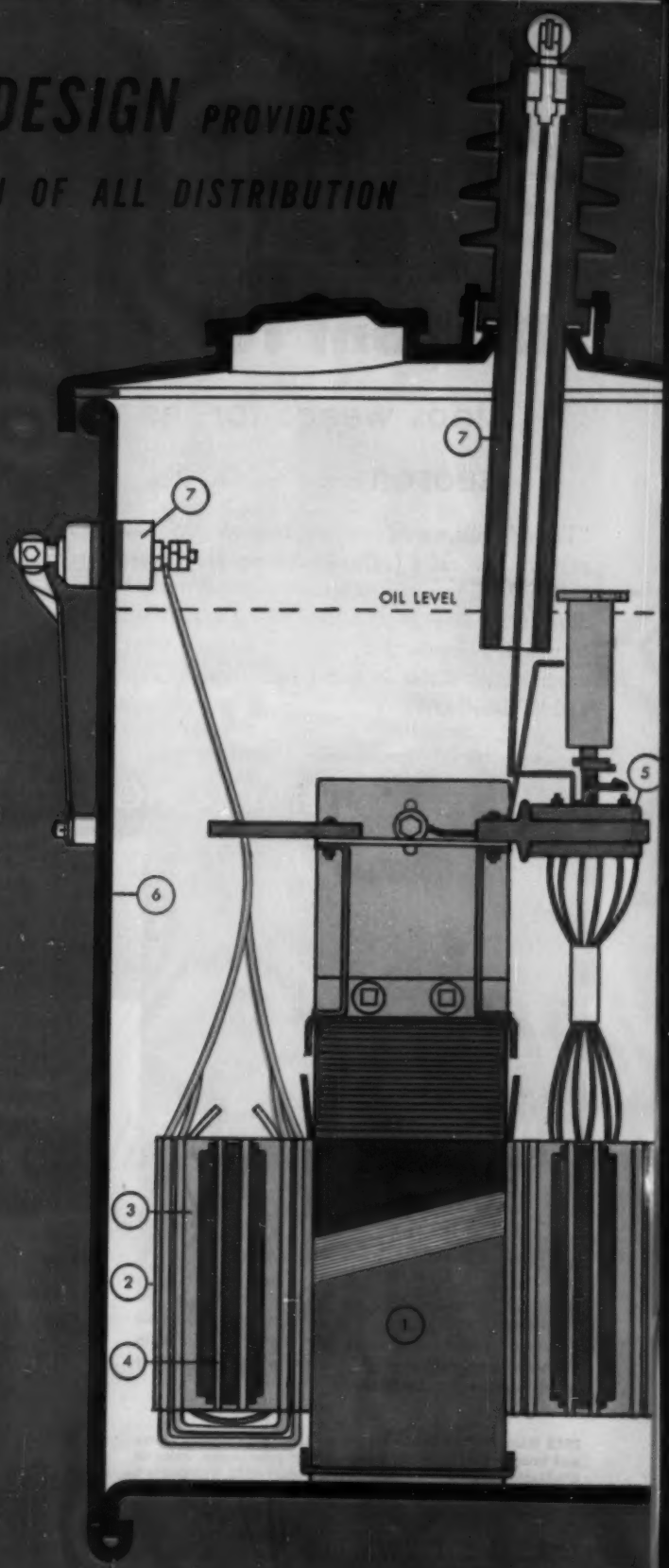

KUHLMAN

KUHLMAN ELECTRIC COMPANY

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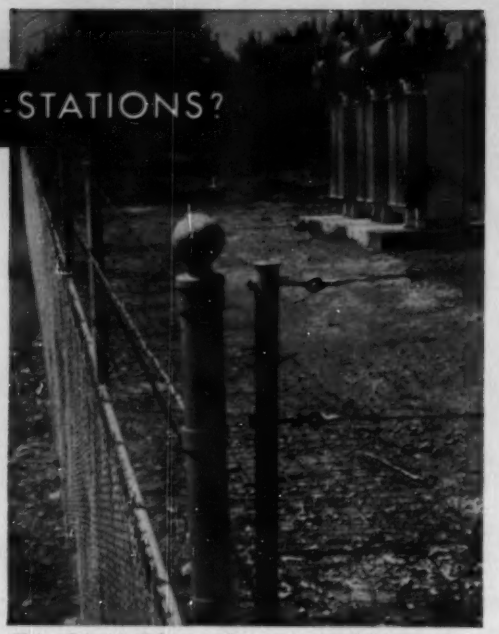
WEEDS AROUND SUB-STATIONS?



"Telvar" is ideal for weed control around fences, poles, towers. It's low in toxicity to humans and animals, non-volatile, non-flammable and non-corrosive to equipment.

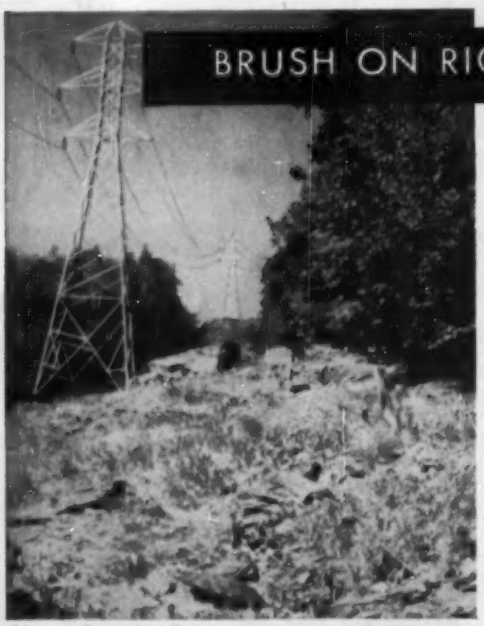
One application of **Du Pont Telvar**®

WEED KILLERS

stops weeds for the season—or longer!

"Telvar" kills weeds through the roots . . . prevents regrowth. Low rates (20 to 80 lbs. per acre) make it cost little for the results you obtain . . . also mean less handling, fewer storage problems. To cut maintenance costs to new low levels, put "Telvar" in your weed-control program. Available in two formulations: "Telvar" W, and "Telvar" DW.

BRUSH ON RIGHT-OF-WAY?



"Ammate" applied five years ago, is still keeping brush down along this right-of-way. "Ammate" allows low-growing cover to return to resist erosion.

One application of **Du Pont Ammate**®

WEED AND BRUSH KILLER

kills more kinds of brush —safely—at lower cost!

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers! When the original spray job is done well, brush is kept under control for years with only an occasional spot spray. You can rely on "Ammate" to do the job safely, even where your right-of-way adjoins cropland, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops. It is no hazard to crews, stock or wildlife.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington 98, Del. In Canada, Du Pont Company of Canada Limited, Box 660, Montreal.

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

Telvar® Weed Killers for industrial use

DU PONT

REG. U. S. PAT. OFF.

Ammate® Weed and Brush Killer

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

EL SEGUNDO Steam Station

on the line with unit 1

The first of two 160,000 kilowatt turbine-generator units recently went into service at the El Segundo station in the Los Angeles harbor area. The new plant, an important addition to the expanding Southern California Edison system, utilizes low cost petroleum fuel from an adjoining refinery.

Bechtel is responsible for the engineering design and construction of both stages, working closely with Edison's engineering and construction department—as it has for a number of years on a variety of projects.

BUILDERS FOR INDUSTRY

BECHTEL

BECHTEL CORPORATION

Los Angeles • SAN FRANCISCO • *New York*

Now

NO AIR PRESSURE NEEDED! Type EVA *contains* the explosion rather than preventing it: no "pumping up" required. Re-lamp right in hazardous areas: just switch off circuit, unscrew globe holder and replace lamp. No pressure switch to fail and create possibilities for hazard. Low initial cost and simple maintenance will mean sustained performance at top economy with these new Crouse-Hinds lighting fixtures.

200 W; with or without guard or reflector; overall length, 13⅜".

Complete, explosion-proof lighting installations for acetylene & hydrogen areas!

CROUSE-HINDS CONDULETS®

UL Approved for Groups A and B Locations

- **The first complete lighting system designed and UL-approved for Class 1, Groups A & B, as well as C & D hazardous locations.**
- **New lighting fixture can be re-lamped even in the presence of combustible gases: gas-tightness not required for its safe performance.**
- **Heavy, shock-resistant construction withstands pressures from internal explosions without rupturing.**
- **Flame-tight joints prevent escape of flame to flammable atmosphere.**

Whether you're installing a complete explosion-proof lighting system — or merely converting a few of your Group C or D fixtures to these safer Group A's — Crouse-Hinds provides greatest safety and economy. See your Crouse-Hinds distributor, or write us.

Explosion-proof Tumbler Switch Condulets

Explosion-proof Junction Condulets

Explosion-proof Sealing Condulets

Explosion-proof Flexible Couplings

Explosion-proof Conduit Unions

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

CROUSE-HINDS COMPANY

SYRACUSE 1, N. Y.

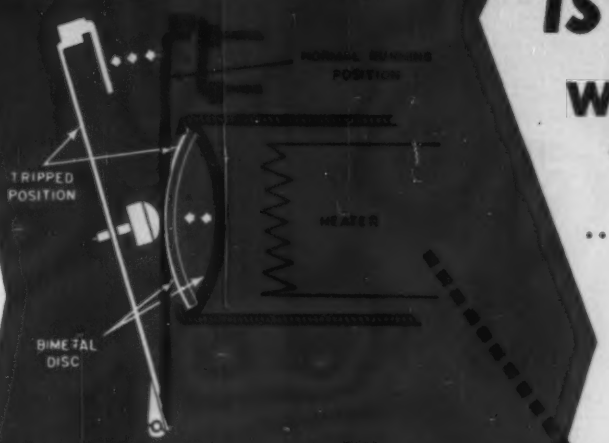
CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING

CLICK!...and your motor is saved!

WESTINGHOUSE

offers a surer method of preventing motor burnouts ...the heater is made of

NICHROME*



HERE'S HOW IT WORKS. At a certain temperature, just below that of a dangerous motor overload, a bimetallic disc snaps from concave to convex, instantly breaking the contacts which carry power to the motor. The heater element, made of Nichrome, is wired in series with the motor, acting as a monitor to apply heat to the disc, at precisely the right moment and in the right amount.

The Westinghouse "Life-Linestarter"

Overload controls for electric motors are of course nothing new—but Westinghouse in its Life-Linestarter offers a basically improved, more reliable type of protection against this costly hazard. Whereas other types, depending on solder, gradually lose their critical calibration as the solder oxidizes . . . Westinghouse protects your motors by a bi-metallic disc type overload relay—a precision device which retains its calibration indefinitely.

Every bit as important as the disc is the heater which actuates the disc. This heater element Westinghouse makes of Nichrome, knowing from long experience that since the thermal and electrical properties of Nichrome do not change, the heater retains indefinitely the sensitivity of performance which is all-important.

Like Westinghouse, many leaders of American industry select Nichrome, since they know that the peerless qualities of Driver-Harris alloys are the result of the most precise metallurgical checks and controls. It is these exclusive quality controls that have long made Nichrome V and Nichrome the standard by which all other electrical resistance alloys are measured.

And if the alloy you need does not yet exist, our engineers will be happy to start tomorrow to develop a new one, custom-made for you. Just let us know exactly what you wish to accomplish.

*T. M. Reg. U. S. Pat. Off.

Sole producers of Nichrome V and Nichrome

Driver-Harris Company HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Louisville, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

IT'S THERE TO STAY...

IT'S A *Standard* TRANSFORMER

Standard

TRADE MARK

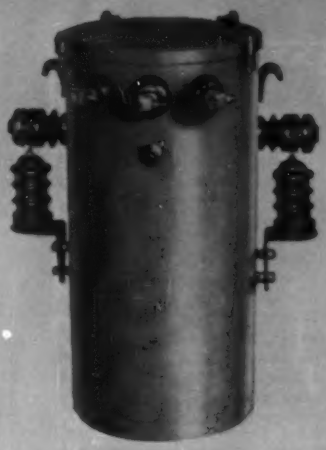
VITAL PART OF

● If transformer failure keeps your linemen busy removing distribution transformers and installing new ones, then it's time to investigate Standard Transformers as a solution to your problem. Once a Standard Distribution Transformer is installed on a line, it's there to stay . . . silently channeling current to your customers.

What makes Standard Distribution Transformers such dependable "watch dogs"? Close examination discloses sound, basic construction in full accordance with ASA and REA standards. Outstanding features set them apart from others as an indispensable and integral part of your distribution system. Covers are moisture-proofed with Neoprene gaskets which prevent oil leakage. They can be easily and quickly removed, allowing immediate access to vital parts. A rugged, copper-bearing steel tank houses the low-loss core assembly of non-aging, varnish-coated, silicon steel sheets. Specially designed core clamps hold core rigidly in place assuring quiet, trouble-free operation. These, plus numerous other construction features, demonstrate Standard Transformers to be helpful in solving your excessive maintenance problem.

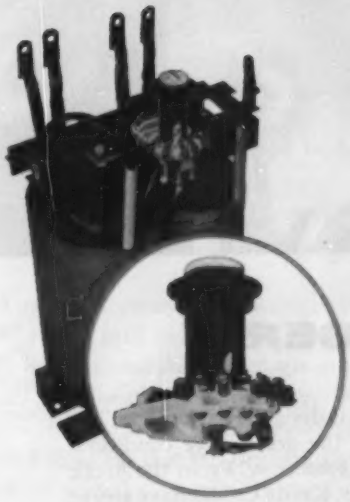
Naturally, you want more information concerning Standard Distribution Transformers than that which we have presented in these limited words. Your nearby Standard Transformer representative has answers to your questions. Call him. Let him show you how Standard Distribution Transformers can help you maintain the excellent service your customers deserve.

Type A. OISC Conventional Distribution Transformer, 15 KVA, single phase, 60 cycle, with side wall mounted high voltage bushings. Standard construction for voltages 5 KV and sizes through 100 KVA.



Type CSP. OISC Distribution Transformer, 15 KVA, single phase, 60 cycle, with primary lightning arresters, internal fuses, low voltage circuit breaker and side wall mounted high voltage bushings. Standard construction for voltages 5 KV and less and sizes through 100 KVA.

TRANSFORMERS ARE A
YOUR DISTRIBUTION SYSTEM



NEW TANK WALL BUSHINGS →

New bushings permit "flick-of-the-wrist" line insertion without tools. No live parts are exposed. Terminal compression stud keeps easy-to-grip, insulated porcelain cap from falling off when unscrewed to receive primary leads. Cables can be brought in from either side and held securely by pressure from the clamping shoe. Makes for faster, safer, easier installations.

← TAP CHANGER SWITCH

Standard's new Tap Changer Switch embodies a contact-making assembly with a brass wheel for positive contact. Normal settings are with 4-tap voltage section. 2½ % taps within 10 % range of normal rating. Standard supplies transformers with 4 taps above or below, or half above and half below as specified by the customer. This is available at no extra cost to you. Contact-making points are submerged in oil with the handle well above oil level.

Standard

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

In the 4th Century B.C., Damocles so admired royal luxury that Dionysius, the monarch of Syracuse, decided to demonstrate to him how precarious is the position of one in power. At a banquet he feasted Damocles in regal fashion. It was not until the dinner was well under way that Damocles noticed a naked sword suspended above his head by a single hair. *Damocles' Sword* has since come to represent an ever-present danger.

POINT OF DANGER

There is a constant menace to cable directly buried in the ground, laid under water, or exposed to the air. The ravages of the elements hang as a threat like Damocles' Sword over cable unable to resist them . . . time itself makes inroads. Fortunately—but not accidentally—Kerite Cable is designed to "outlive," by many years, the destructive conditions of today and tomorrow. From the Arctic to the Tropics, Kerite Cables have served under the most adverse conditions. Unlike Damocles' Sword, Kerite, wherever it serves, engenders confidence.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

A Look at the New EEI President

"We must cease indulging mediocrity in ourselves and in those with whom we deal." These words from an address he made at a commencement of the University of Georgia helps to express the philosophy of Harllee Branch, Jr, new president of the Edison Electric Institute.

But while these words set forth the high standards to which the Georgia Power Co executive adheres, when taken alone they could give a distorted picture of the man himself. Too often when a man is dedicated to overcoming mediocrity—striving for perfection—he is apt to become caloused in dealing with other people. Branch has avoided that pitfall.

Above all else the young Georgian has a keen and natural appreciation for the worth of human relations and human understanding. He graciously accepts the responsibility which industry has for the communities it serves. Branch goes even further, for he feels that he has a social and economic obligation to the people of Georgia including those not served directly by his company.

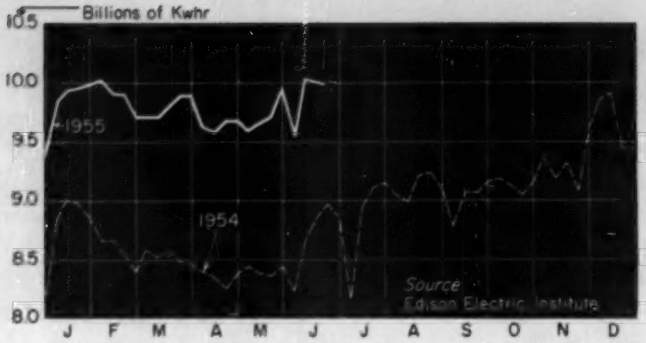
Area development has always been important to him. He said in a recent interview (p. 86), "We have figured that if Georgia grows, we will grow. If it doesn't grow, we're stymied no matter how well we operate our business." It is on this sort of thinking that the Georgia Power Co has built its annual Champion Home Town contests which have been unanimously endorsed by both houses of the Georgia State Legislature.

Most people in the industry know Branch as a capable lawyer, one conversant with the problems of public power and utility regulation through his 18 years of experience with Georgia Power Company's legal counsel. They know that in 1949 he joined the company as a vice president and general manager, becoming president two years later.

Not many know one facet of his background that is omitted from most of his formal biographical sketches. This Davison College and Emory University graduate is a former Atlanta Journal news reporter and once directed publicity for one of Atlanta's biggest radio stations. This background makes him keenly aware of the value of a "good press" to the electric utility industry as well as his own company. His actions as President of EEI are sure to reflect his belief that the industry must speak out because "A well-informed public is our best hope for fair treatment."

Branch has another important talent that stands him in good stead for the EEI position. He is an accomplished speaker with a flair for expressing complex subjects in popular terms. His easy platform manner as well as his knack for speaking with small informal groups well befits the new spokesman for the industry.

Young, only 49; educated and experienced as a utility lawyer; experienced, too, as a utility executive; and with journalistic background, Harllee Branch can be expected as EEI president to battle mediocrity within the institute and the industry. But it will be a battle that leaves no scars because he is a man who puts the highest values on human relations and human understanding.



OUTPUT

Week Ended June 18

9,987,000,000 Kwhr

Up 12.8%

Atomic Energy Commission requirements — 840,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 7.5%

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
June 18	+12.8	+8.5	+9.1	+17.7	+0.3	+21.3	−1.5	+9.1	+9.5	+10.7
June 11	+16.0	+10.2	+10.2	+23.5	+4.5	+23.8	+4.9	+10.3	+7.7	+13.3
June 4	+15.6	+8.4	+9.2	+23.0	+7.2	+23.6	+9.6	+7.1	+10.0	+8.3

Seasonally Adjusted Index 192.4 Week Ago 195.8 Year ago 171.3

The Issue's Highlights: Harllee Branch, EEI's new president, speaks out in an interview . . . Full report on the EEI convention in Los Angeles . . . House approves funds for TVA tie-in with MVGC's proposed West Memphis, Ark., plant . . . President Eisenhower signs into law new REA allotment formula . . . House subcommittee approves Upper Colorado Project, eliminating Echo Park Dam . . . South Carolina legislative committee outlines investigation procedure for probe of Santee-Cooper's finances . . . How utilities are tackling adequate wiring problem is shown in special EW survey . . . Latest EEI power survey shows first quarter electrical equipment orders top 9-million kw.

Atomic Power: Principal problem of the nation in achieving atomic power "is one of interesting a sufficient number of able scientists and engineers in the task," according to Dr Willard F. Libby of AEC. He also notes that granite rock could become atomic energy source as it contains a theoretical fuel value 50 times its weight in coal. It is not yet possible to say whether this fuel can be recovered, he added . . . Ford Motor Co, in cooperation with AEC, has launched $100,000 study of atomic fuel elements.

New and better insulating materials have been made experimentally at the Naval Research Laboratory by the use of nuclear energy. Raw materials, liquid or solid, have been transformed into solid dielectrics after exposure to radioactive Cobalt-60. Conductors using these dielectrics will be able to withstand higher operating temperatures with lower losses. Because of radiation exposure during manufacture, these materials can withstand additional radiation such as may be encountered in nuclear power plants.

Riverside, Calif., City Council has set Aug 2 as date for special election to determine whether or not city will accept California Electric Power's offer to buy its municipal light department . . . Nashville (Tenn.) Power Board has approved 1955-56 budget of $5,547,600, next to largest in city's history. Budget will go largely to continue projects underway, says General Manager Leonard Sisk.

Kansas City P&L has completed its $50-million Hawthorn Station by placing in service last 100,000-kw unit. This brings station capacity to 332,000 kw . . . Otter Tail Power and Bureau of Reclamation have signed 20-year contract covering purchase of power and use of company's transmission lines to feed Missouri River power to co-ops in Otter Tail's service area . . . Central Maine Power has successfully laid 12.47-kv, 3-phase submarine cable across more than two miles of Penobscot Bay to Islesboro.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Off the Washington Wire: House has voted to authorize federal construction of $220-million Trinity River Project in California. Bill leaves question of partnership development of project's hydro power until later . . . If reports that a "deal" is on are correct, quick House Interior Committee action on Upper Colorado bill can be expected . . . Major differences over NRECA policy on federal G&T loans may split co-op association's board of directors before long. New Mexico's member, Oliver Kimbrough, is displeased with national NRECA policies as expressed in organization's publication, Rural Electrification Magazine. He may quit.

FPC has issued 50-year license to Warrior River Electric Cooperative Association for 34,000-kw, $14-million hydro project on Locust Fork of Black Warrior River, Ala. . . . Tacoma, Wash., has applied to FPC to increase Cowlitz River hydro capacity from 345,000 kw to 460,000 kw.

Metropolitan Edison plans 1,000,000-kw steam plant for Northern Delaware Valley, Pres O. Titus announced June 20. First of eight units has already been ordered. It will cost $25 million, and develop more than 165,000 kw. The Sulzer-type once-through boiler will produce 1,100,000 lb of steam an hour at 2,400 psi and 1,050 F with reheat to 1,050 F. It will be built by Combustion Engineering. Turbine generator by GE will be among first utility owned high-pressure cross-compound axial-flow units. Condenser will be back of turbine at floor level. Site of plant is Sandy Shore, Pa.

Construction spending by private power companies in 1955 is estimated at $1.85 billion by Commerce and Labor Departments, down $100 million from forecast last November. Revised total spending estimate of $41.8 billion for new construction, however, shows rise of $2.3 billion above previous outlook figure.

Finance: Northern Indiana PS plans to sell 120,000 shares of $100 par preferred stock . . . Duke Power has asked North Carolina Utilities Commission approval to buy distribution and street lighting systems in Badin and High Rock from Carolina Aluminum for $17,656 . . . Georgia P&L may sell $10-$12 million new securities this year.

Chester H. Lang, a vice president of General Electric Co for last 14 years and vice president in charge of public relations since 1951, will retire July 1, closing a career of about 40 years with the company.

ABOUT PEOPLE IN THE INDUSTRY

Washington Water Power last week accepted $20 million for its Chelan County properties from Chelan PUD following 10 years of litigation. Said Pres Kinsey M. Robinson of the condemnation settlement: "We are now compelled to bow reluctantly to the powerful PUD law enacted in 1930, which gives any organized PUD the right to start condemnation proceedings against private utility properties . . ." Many voters who supported the "strange PUD law" in 1930 "have told us they wish they had it to do over again."

Trend in Pacific Northwest is toward "fuller dependence on steam," according to J. Frank Ward, managing director of State Power Commission. He made remarks following SPC talks with public and private utilities on possible financing of new steam plants. "We are passing out of all-hydro power phase," he said, "because of difficulty of getting hydro projects underway." Ward estimates state will need 1-billion kw of steam generated power by 1968 with first 300,000 kw by 1958, and another 300,000 kw by 1959.

More News About People Page 252

Harllee Branch Calls for

• EEI's newly elected president says industry must promptly and boldly answer attacks and misrepresentations of its foes

• The public is inherently on side of free enterprise but it must be given more information, adds Georgia Power executive

"I'm just a beginner . . ."

"We must tell the facts . . .

and stand up to meet attacks"

Harllee Branch, Jr, president of Georgia Power Co and newly elected president of the Edison Electric Institute, discussed his views of the electric industry in an exclusive interview with Electrical World last week. Here are the questions and answers:

Q. What are the most important problems facing the member companies of the Edison Electric Institute?

Branch: "One of the most important problems facing our industry is one of communication. Most folks have little understanding of our operations or our contributions to the communities we serve. We have just not succeeded in getting our story across to the public. Too few people have sufficient information on our industry to evaluate fairly the arguments made by those who preach the gospel of federal power. I'm afraid we are going to see an intensification of the efforts of those groups in the future, and we must get our story across to the public."

Q. Mr. Branch, do you have any suggestions for solving this problem?

Branch: "First, we must start talking in a language more people can understand. Ours is a technical industry and our language tends to be too technical for the man in the street to understand. We must present our story accurately, forcefully and interestingly. We must stand up and promptly and boldly answer attacks made upon us, marshalling our facts as a lawyer does before a jury.

"Facts, you know, can deflate the most bitter tirades of our enemies. We have been negligent in not effectively presenting our story. Too often we have been too busy and too divided in our efforts to answer effectively the misrepresentations of the public power advocates. We should be prepared to meet them promptly and effectively. A well-informed public is our best hope for fair treatment."

Q. In a recent survey we note that a majority of the people favored the private enterprise principle underlying Dixon-Yates contract. Yet when questioned specifically on contract, many said it was "not such a good idea."

Branch: "That is what I mean by our weakness in communication. There was a failure to present at the onset the pertinent facts of the contract in terms the people could understand and appreciate. Our enemies got in their licks before our own industry was allowed to give the true facts. A long silence, for which the industry was not to blame, let the contract be misrepresented. It's tough to change the brand on a calf after it's been applied. That's what I had in mind a moment ago when I said we ought to answer our critics promptly and boldly."

Q. You mentioned that the industry is sometimes divided in its efforts?

Branch: "Well, I mean that individual companies or groups of companies too often have had to fight their local battles single-handed even though national and all-important industry issues were involved. We must fight the proponents of government power by an intelligent, persistent, and united effort to tell our story to a public that is inherently on our side."

Q. Harllee, what other important areas need attention?

Branch: "The maintenance of good service is, of course, a primary concern. After all, service is the reason for our existence. We should assure ourselves that dependable service is provided every single customer—good service at all times—good service beyond the low whisper of duty. Yes, service that gets talked about—the kind that will bring a hundred voices clamoring to our defense when one voice is raised against us."

Q. You're a great believer in selling?

United Front Against Federal Power

Branch: "Yes, I certainly am. Production in an electric utility, as in any other industry, is only half of the economic equation. Distribution is the other half. An ever wider distribution of kilowatt-hours should be one of our goals. We should seek to achieve that goal through a selling program aimed at true and complete electrical living throughout our service areas."

Q. What do you see ahead in way of growth of electrical industry?

Branch: "I believe our industry will continue to grow during the next few years at about the same rate as in the last two or three years. Our expansion may be at an even higher rate. You know, of course, that the southeast is the fastest-growing section in the country when it comes to power production. Since I come from that section, I am naturally very optimistic."

Q. Good service requires good electrical systems. Are utilities doing enough to improve reliability of service?

Branch: "We are doing a good job —but I think maybe we can do an even better one. The requirements of all-electric customers means that interruptions to service must be avoided to the maximum extent possible. We must build our systems for the kind of customers we will have ten years from now—maybe that will be the cheapest in the long run."

Q. Do you have any changes in mind for EEI?

Branch: "EEI has a fine record for service to the industry. The committees are staffed with men competent in their respective fields. They are doing a good job of handling industry problems as they arise. I think EEI will want to take a more active part in solving inadequate wiring conditions, and in bringing all industry groups together in solving our other common problems. However, you have to realize that I'm just a beginner in this job. I certainly don't have in mind any drastic changes in EEI policy. My predecessors have done a good job in my opinion."

Q. Would you expand your remark about the need for doing something about inadequate wiring?

Branch: "Well, I believe the sale of electricity can't be effectively promoted in the face of inadequate wiring. A short time ago in one of the divisions of my own company we checked the records on 37 houses in which certified adequate wiring had been installed two or three years earlier. The houses were selected at random. They were located in various parts of the division. The average monthly consumption of these adequately wired homes was 522 kwhr whereas the division average for the same period was only 219 kwhr per month. There is nothing isolated or unique about the example."

Q. I believe your company was one of the pioneers in area development?

Branch: "Yes, but I hope you won't confuse that with just selling kilowatt-hours. In that program, which started before I came with the company, we set out to promote the entire state of Georgia, not just our own service area. We've been primarily interested in making Georgia a better place in which to live and work. We have figured that if Georgia grows, we will grow. If it doesn't grow, we're stymied no matter how well we operate our business."

Q. What about utility management needs for the future?

Branch: "The problems and the growth of the industry which we have been discussing make the answers to your question pretty obvious. We must do more to train future management. Training programs like the industry is conducting at Georgia Tech, Michigan State, and elsewhere, are helpful. But giving opportunities to men on the job for carrying more responsibility provides the best training. We must have men who can run the electric business and not let it run them. Our managers must be at least as good as the apparatus they are going to operate."

Branch, in addition to being president and director of Georgia Power, is a director of the Southern Co and of Southern Services, Inc. In 1953 he was appointed director of the Federal Reserve Bank of Atlanta.

One of the youngest presidents EEI has had, Branch is noted in the electric utility industry for his qualities of dynamic leadership.

DONALD S. KENNEDY, president and chairman, Oklahoma G&E, is shown with Branch whom he succeeds as vice president of the Edison Electric Institute

House Okays Dixon-Yates Line

. . . to tie in with TVA system for power delivery to AEC; alternate plan for TVA plant voted down; Senate expected to go along

The new Dixon-Yates firm, Mississippi Valley Generating Co, breathed a little easier last week since it appeared that the power from their new plant would be delivered after all.

The Eisenhower Administration, which made a contract with MVGC for delivery of almost all the power from the 650,000-kw steam plant the company is building at West Memphis, Ark., almost assured this. For it got the House to go along with its request for $6.5 million to build a new Tennessee Valley Authority transmission line to conect with the new MVGC plant.

Administration officials and their friends in Congress have taken up the fight in the Senate, where an appropriations subcommittee is now considering the TVA money bill. Chances are the Senate will go the way of the House, and TVA will get its money to build the transmission line from its system to the Dixon-Yates plant now under construction.

Victory for Administration

The House fight looked close before members voted. As it turned out, however, the Administration won easily over public-power Democrats who put up a last-ditch fight to block money for the line to the private plant. Instead, they pushed hard for a rival TVA plant at Fulton, Tenn.

If Dixon-Yates' foes had won, the Administration and MVGC would both have been faced with the question of finding another way to build the line. This could have led to Dixon-Yates' financing of the new line if the company wanted the contract badly enough.

The House vote to build the line was 198 to 169 on an amendment to the TVA fiscal 1956 money bill. This killed a Democratic-sponsored provision to transfer TVA's requested $6.5 million to the Fulton Plant; and had the effect of approving the $6.5-million for the transmission line.

In Senate committee hearings, which started right after the House completed its action on the bill, public power witnesses appealed strongly for a reversal of the House vote.

Thomas H. Allen, Memphis, Tenn., municipal utility chief, declared his city will build its own plant rather than be forced to depend on the Dixon-Yates plant. He said that Memphis officials would be constantly worried over dependability of service and rates and that they did not want any part of "liquidation of TVA."

Allen's stand was endorsed by Alex Radin, manager of American Public Power Association. Gov Frank Clement of Tennessee expressed suspicion that the MVGC-AEC contract was born under questionable circumstances.

The Democrats on the Senate committee were expected to take some time considering the bill in order to build up a record from which they can pull quotes during next year's election campaign.

The TVA-Dixon-Yates fight created an uproar for a few days, but actually it concerned only a small part of the money represented in the appropriation bill acted on by the Representatives. House members also took the following action:

- Voted $1,372,122,800 to operate TVA, the Atomic Energy Commission, the Reclamation Bureau, Bonneville Power Administration, and Southeastern and Southwestern Power Adminis-

KU Crew Wins Matthews Valor Award

Live steam and scalding water gushing from a broken boiler feed-line did not stop a 10-man Kentucky Utilities Co generating station crew from taking quick action to prevent a catastrophe which would have caused a serious power shortage. The crew members' brave and effective handling of the emergency won them the electric industry's Claude L. Matthews Award for Valor, presented at the 23rd annual convention of the Edison Electric Institute in Los Angeles.

According to the citation, each member of the operating crew "took prompt, considered and courageous action, without regard for personal safety, to prevent further disaster and to maintain service" to the utility's customers.

Paul A. Compton (third from left), engineer in charge of the shift, accepted the award on behalf of the crew. The presentation is being made by the donor, Claude L. Matthews. Others in group are Mrs Compton; Frank H. Pope, superintendent of KU's Green River Station where the event took place; D. C. Webster, director of employee relations; and E. W. Brown, vice president in charge of operations.

trations for the fiscal year beginning July 1. All these are federal power agencies, so they were grouped together in the same money bill by Democrats who thought they'd have a better chance to buck the Administration's partnership power policies.

- Restored more than $32 million for Reclamation Bureau projects. The House Appropriations Committee had knocked these out of the Administration's budget request.
- Added $46 million, restoring Corps of Engineers construction and planning funds. This included $500,000 advance planning money for John Day Dam on the Oregon-Washington border; $200,000 for Lower Cumberland Lock and Dam in Kentucky and Tennessee; $10,000 for Hills Creek Reservoir, Ore.; $450,000 for Eufala Dam, Okla.; and $450,000 for Dardanelle Dam, Ark.
- Defeated an amendment to add more than $9 million for a 160-mi transmission line from Fort Randall to Grand Island, Neb.

Montana Power to Ease Wyoming Hydro Shortage

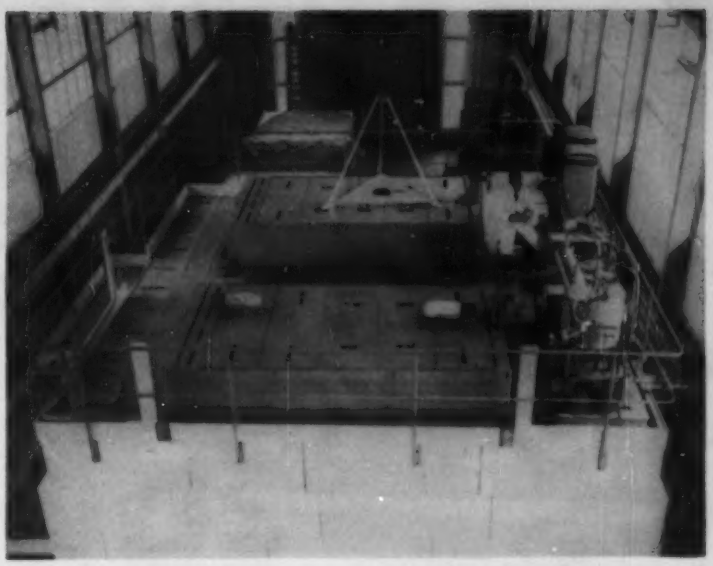
Pacific Power & Light Co and Montana Power Co have reached an agreement to turn up to 60,000 kw of excess Montana power into Wyoming lines this fall.

Pacific P & L's President Paul B. McKee told a meeting of the utility's Wyoming Division employees that the $1.5-million plan includes construction of a transmission line between Billings, Mont., and Lovell, Wyo.

McKee explained that the plan, which has been submitted to the Bureau of Reclamation for approval, would stave off a threatened power shortage in Wyoming until a proposed steam plant can be built, McKee said. The proposed line from Billings to Lovell would tie in with the Bureau of Reclamation's Wyoming system.

Low water flows in drought-stricken Wyoming, McKee said, threaten to reduce the Bureau's hydro output.

Even with the additional Montana power, McKee observed, Wyoming still will need a proposed new 60,000-kw steam generating plant. A site for the steam plant has not been definitely picked. Lake DeSmet, near Buffalo, has been studied by Pacific P & L as a possible site because of its large coal reserves and the availability of water.



British H-W Reactor Is First of Ten

The British reactor known as Dimple (shown above) is the first of ten heavy-water reactors to be constructed in the nation's 12-plant atomic power program (EW, June 13, p 62). The reactor consists of a large aluminum tank filled with heavy water and surrounded by a graphite reflector. Canned uranium rods are hung in the tank. Dimple, nickname for the reactor, is an abbreviation of deuterium-moderated pile, low energy.

Ike Signs New REA Formula

President Eisenhower has signed into law a change in Rural Electrification Association's so-called state allotment formula.

Now, for the first time, that agency has the power to distribute its funds with emphasis on current power needs in each state, rather than on the basis of the number of farms still unelectrified.

When originally written in 1936, the REA Act included a safeguard against arbitrary distribution of loans by stating that the number of unelectrified farms in a state compared with the national average be used to determine the proportion of loans to which the state was entitled. Fifty percent of yearly loan authorizations were earmarked for use in this fashion; no more than 10% could be used for any one state.

This has now been changed so that 75% of all yearly authorizations may be used at REA's discretion.

The change was requested by REA Administrator Ancher Nelsen to enable the agency to meet anticipated large demands in Colorado where plans were afoot as early as last year to call on REA for up to $40 million.

Under the old formula, Colorado qualified for only about $15 million because most of its farms were already connected to central station service. Nelsen says the flexibility added to the program by the new law means an end to any such deadlock for some time.

Within the last few weeks, REA has approved two loans for Colorado cooperatives, one of $10,155,000 for the Colorado-Ute Electric Association, Inc, to build a 25,300-kw steam plant and transmission line, and one of $3.5 million for Arkansas Valley G&T, Inc, to boost its capacity.

Both these loans were made under the old formula, but they involved release of $35 million from REA's reserve loan fund, since Colorado's allotment was not quite big enough to accommodate both loans. Under the new setup, there would have been no need to draw down the contingency fund.

Ike inspects Penn State's reactor and presents program winning...

Congress Unit OK for Foreign Atom Aid

Approval of President Eisenhower's plan for helping friendly foreign nations in their peacetime development of the atom has been voiced by the Joint Congressional Atomic Energy Commission.

Speaking at the commencement exercises for Pennsylvania State University, the President declared that he would submit two proposals to Congress in an effort to remove the legal and financial roadblocks hampering U. S. aid for foreign atomic development.

First, President Eisenhower said that he would recommend that the U. S. offer research reactors and the necessary fuel to friendly foreign nations. The U. S. would foot half the bill. Second, he would propose giving those friendly and financially able nations "access to and training in the technological processes of construction and operation (of nuclear reactors) for peaceful purposes."

A few days after the President had announced his plan, the Joint Congressional Atomic Energy Commission recommended spending $5-million to carry out his first proposal.

The program undoubtedly would open new markets for manufacturers of atomic equipment. As an indication of the industrial and economic changes ahead with broader development of the atom, the President in his commencement address referred to "estimates that world sources of uranium . . . contain as high as 20 times the energy of the known world reserves of coal, petroleum, and natural gas combined."

While on the Pennsylvania campus, the President also received an honorary degree of doctor of laws and inspected the University's "swimming-pool type," low-cost, research reactor, now ready for operation. He is shown above at the reactor's control board with his brother, Dr Milton Eisenhower, the University's president, (left), and Dr William Breazeale, professor of nuclear engineering (right).

Truman's NW Blast Answered by McKee

Partisan political motivations at the root of ex-President Harry S. Truman's recent attack on the Pacific Northwest utility industry's efforts to help develop Northwest hydroelectric resources (EW, June 20, p 64) have been underlined in a rebuttal by Paul B. McKee, president of Pacific Power & Light Co.

Said McKee, "The power needs of the Pacific Northwest are far too serious for anyone to play politics with them as former President Truman did . . . Such words as 'giveaway' and 'raiding' are obviously scare words designed . . . to confuse the issue."

Upper Colorado . . .

. . . project is passed by House subcommittee with Echo Park eliminated from over-all plans

The trimmed-down House subcommittee version of the Upper Colorado River Project, eliminating controversial Echo Park Dam, at midweek needed only a formal meeting of the Interior Committee to report the authorization bill.

The committee was waiting for a call from Chairman Clair Engle (D-Calif.) to re-approve the politically manicured measure, already voted 18 to 6 by the Irrigation subcommittee—which includes all 32 members of the parent group.

Engle and his majority on the committee had cut out Echo Park to make the bill passable by the House. The reworked bill would authorize an $843-million, 933,000-kw three-dam development of the Upper Colorado River Basin. Retained in the measure are the $421-million 800,000-kw Glen Canyon Dam, the $82-million 72,000-kw Flaming Gorge Dam, the $36-million Navajo Dam (no power), and 11 participating irrigation projects, including the $231-million 61,000-kw Central Utah Project.

Slim Chances for Big Bill

House sponsors of Upper Colorado River development saw no chance for winning approval this year of a big $1.7-billion, 1,140,000-kw bill such as the Senate passed April 20 (EW, May 2, p 46). Even the $930-million 1,060,000-kw plan backed by the Administration was more than they figured the House would pass with Echo Park included.

Steamed-up pressure on Congressmen from conservationist and garden club groups to defeat the Echo Park invasion of the Dinosaur National Monument would kill the Administration measure in the House, they feared. So Engle and his team-mates deleted the hot Echo Park proposal with their recommendations that it be restudied.

The Administration reduced the size of its package this year but retained Echo Park Dam. The House Committee pulled a switch by dropping Echo Park (a $176-million, 200,000-kw project) and writing in Flaming Gorge, an $82-million, 72,000-kw dam, in its place.

Santee-Cooper . . .

. . . probe is outlined by state legislative committee assigned to investigate financial status

The line of investigation to be followed by a state legislative committee in probing the financial difficulties of the South Carolina Public Service Authority (Santee-Cooper) has been announced.

Formation of the investigating committee was an off-shoot of Gov James F. Byrnes' annual address last January. He recommended an investigation to determine the Authority's ability "to meet its financial obligations and the customary payment to the state of $200,000 annually." The governor predicted a $1-million deficit for the Authority in the current fiscal year.

At its first meeting in Columbia, S. C., the committee drafted a series of questions to be answered by its investigation. They are:

1. Is Santee-Cooper being operated efficiently and economically?

2. How does Santee-Cooper compare with private utilities in power rates, production and distribution costs, and payments of consultant fees?

3. What services are rendered by Santee-Cooper to rural electric cooperatives; what rates are involved?

4. Have payments for land, water, and storage rights been unreasonable?

5. Should laws be enacted to allow Santee-Cooper to compete with private power companies in distribution and sale of power?

6. Should Santee-Cooper be subject to certain legislative and state controls (in conjunction with federal interests)?

The committee, after adopting the outline of objectives to be followed in its investigation, voted to meet again no sooner than July 15.

Kaiser Designs Reactor

Henry J. Kaiser Co has been designated as architect-engineer on an engineering test reactor for the Atomic Energy Commission. Kaiser Engineers Division at Oakland, Calif., has begun work under its AEC contract which includes nuclear design. The AEC-Kaiser contract parallels an earlier AEC invitation for industry to submit proposals for construction of test reactor with private funds.

Cooked 'Coon on a Bushing

Fireworks, spewing from a transformer enclosure recently brought Scranton (Pa.) Electric Co employees to the scene on the double. There, pondering the loss of 30,000 kw of electric energy and equipment damage totaling $1,000, they reconstructed an Uncle Remus shocker.

A curious raccoon apparently had scampered up the fence surrounding the transformer, leaped expectantly to the other side, and landed on six 23,000-v bushings. Result: An impotent transformer and cooked 'coon.

Hoover Dam Power Cut To 65% of 1955 Allotment

Allottees of power from Hoover Dam will receive only 65% of energy originally allocated them for the year beginning June 1, 1955, it was announced following a recent meeting of power allottees and Bureau of Reclamation officials convened in Boulder City.

More than 30 power company officials and government engineers of the Reclamation Bureau agreed to the power cut in view of the low level of Lake Mead, which reached a record low during April of 1,089.4 ft, and the sparse runoff of the Colorado River.

It was originally estimated that the cut would be only 25-30%. But the Colorado River flow has been less than anticipated making the more drastic cut necessary.

The major share of the power will go to the Metropolitan Water District of Southern California, which receives 35%. The states of Nevada and Arizona will receive 17.6% of the power, 17.5% will go to the Department of Water and Power in Los Angeles, 7% to Southern California Edison Co, and the remainder to several southern California municipalities and power companies.

It is possible, Bureau officials said, that the amount of reduction in the power output for the coming year will be revised slightly, after the runoff into the lake is known at the end of July.

Idaho Co Buys Power

Idaho Power Co has announced the purchase of 100,000 kw of electric energy from Utah Power & Light Co on an interim basis. T. E. Roach, Idaho Power's president, said the purchase was necessary because of delays in the authorization of his company's Snake River projects. The higher cost steam power from Idaho is required to supply customers' needs until additional hydro can be built for power users located in southern Idaho and eastern Oregon, he explained.

Because today . . .

- **Utilities are needlessly handicapped by legislation enacted in past years.**
- **Unfair statutes block efforts to reduce cost of electricity, penalize the customer**
- **Destructive tax inequities favor government power businesses**
- **Preference privileges to a few render federal power marketing unfair**
- **Below-cost prices for electricity from government power projects give significance and propaganda value to preference clause**
- **Costly federal regulation duplicates that of state regulatory commissions**

HAROLD QUINTON, President of Edison Electric Institute and President of the Southern California Edison Co, Los Angeles

Edison Electric Institute head tells convention . . .

Fight to Correct Unfair Statutes

Electric utility companies today find themselves needlessly handicapped and burdened with provisions of law enacted during the past 35 years, that, in the best interest of their customers and of this country, should be corrected. Clearly the duty devolves on us, the managers of utility companies, to devote our serious and best efforts to assist in bringing about these needed corrections.

Briefly the more important federal statutory provisions that call for correction are:

1. The tax exemption granted governmental proprietary power businesses

2. The preference provisions in the sale of federal government power now enjoyed by certain electric customers at the expense of all others

3. The needlessly costly and burdensome duplicate regulation by federal government agencies on top of the regulation by state government agencies

It is never an easy, and generally a thankless task to revise statutes which afford special benefits to a certain privileged class; but electric utility companies serve some 40 million customers, or about 80% of the total for the nation. We are duty bound to strive to obtain the enactment of laws that are fair to the customers' present interests and that safeguard their future interests as well.

We shall consider here only the best interests of the customer without reference to the investor and his important relation to the matter because the consumer is prone to lose sight of the fact that his best interest over the years is identical with that of the investor. Without the voluntary investor the consumer's economic freedom would also shrivel and disappear.

We as utility managers, and our customers must always clearly see that in struggling to obtain fair and wise federal legislation we are working primarily for our customers and only secondarily for our investors.

A Just Cause . . . The position of the companies is inherently strong, positive and just. Their opponents' position is inherently weak and defensive for they argue for the preservation of unfair, special privileges that are harmful to the broad public interest.

The companies first problem will be to get the public to take account of its own broad and vital interests in the years ahead. Their second problem will be to prevent the beneficiaries of special privileges and those devoted to federal government ownership of industry from succeeding in clever maneuvers to disguise the real issues, and to confuse the public with false accusations and smoke screens.

Congress will be moved to amend the unsound provisions of law affecting electric utility companies, not by any knowledge that the price at which federal government power is sold represents only a part of the true cost of such power to the Federal Treasury, not by showing up the false 18-in. yardstick of TVA, for example, but actually by growing irritation with the conduct of government power agencies and growing fear of big government and the ominous power of federal monopolies.

Destructive Tax Inequities . . . Destructive taxation, can accomplish specific damage by exempting certain sectors of a business from their heavy burden.

The uninformed assume that because governmental businesses sell their products at prices below privately-owned business, the government-operated system is better and, therefore, the government should go deeper into business as a means of holding down the cost of living. The high cost of taxation, as it affects the cost of living, drives families to demand that the government do more and more things for it. Thus taxation creates a pressure to push the government deeper into all businesses, including

electric power even though it represents only 1% of the cost of living.

Private power plants generate taxes as well as electricity. The average utility company is now paying 22.8% of its gross revenue in federal, state and local taxes, and has been for the past several years. TVA is paying 2.7% of its gross revenue in lieu of local taxes. Neither TVA nor any governmental power business pays federal taxes, although the companies are paying an average of 13.9% of gross revenues in federal taxes alone.

Corrective Tax Legislation . . . Consider this brief outline of corrective legislation necessary to bring tax equality to customers of all power systems:

1. All Federal power projects should be required by statute to include as part of the project and part of the operating costs such sums as would be payable as taxes by private enterprise carrying on the same or similar business. The portion of such sums as would be equivalent to federal taxes should be paid into the Treasury.

2. Federal power projects or the part of federal multipurpose projects realistically allocated to the power function should be made subject to state and local taxation the same as other property and business and the tax payments made to the respective tax collecting agencies.

3. The tax exemption presently enjoyed by the proprietary power businesses of states, municipalities, public utility districts and other governmental proprietary businesses should be removed.

4. The tax exemption on the income from securities issued to finance such governmental power businesses should be removed; or, the same exemption extended to income securities of all businesses.

A Fair Marketing Policy . . . The unfair and indefensible provisions of law covering the sales of power from federal generating plants wherein preference is granted to a few at the expense of the many should be corrected. The value of preferences in buying power from federal projects arises entirely from the fact that the federal government generally sells its products far below true cost. What the consumer is not charged federal taxpayer must make up.

This unfair legislation concerning the sale of power from federal power plants should be amended to require:

1. That power be sold at the point of generation at its fair market value and be allocated in proportion to the number of rural, residential and retail commercial customers served by the respective applicants.

2. That the federal government should be required to compute its true cost of power including the full cost of money and the full equivalent of federal and local taxes.

3. That where the cost of government power would then exceed its market value, Congress should be periodically informed of the losses of those projects.

Government Cost Concept Faulty . . . Consider the federal government estimates and computations of cost! The federal Power Commission uses only 4.4% as total fixed charges on federally-financed hydro-electric plants and only 3.9% as total fixed charges on federally-financed steel-tower transmission lines in figuring power cost. Power companies generally find their total fixed charges run between 13 and 14%.

To correct these faulty cost computations:

1. Total annual fixed charges on federal hydro-electric and transmission line projects should carry 5.4% or the equivalent of taxes, federal, state and local.

2. There should be an item of about 3½% for the cost of money, and an annual amortization charge of 2% on a 50-year life for such projects.

3. Fixed charges should also include a small item of ¼ of 1% for replacements to keep the property in operating condition.

4. There should be a charge for insurance bringing total fixed charges to the order of 11%—which is a far cry from the 3.9 and 4.4% used FPC in figuring rates.

Such charges would lift from the shoulders of the taxpayer a large part of the tax load he now carries because of these projects.

Eliminate Duplicate Regulation . . . When the Federal Power Act was passed in 1920, provisions were inserted therein that undoubtedly were designed to avoid superimposed federal regulation on top of state regulation. Section 19 of that act carried the proviso: "That the jurisdiction of the commission shall cease and determine as to each specific matter of regulation and control prescribed in this section as soon as the state shall have provided a commission or other authority for the regulation and control of that specific matter."

Part II of the Federal Power Act, enacted in 1935, provides that federal regulation over the transmission of electric energy and interstate commerce and the sales of such energy at wholesale in interstate commerce shall extend only to those matters which are not subject to regulation by the states."

The FPC should be required to accept the decisions of the state commissions concerned in practically every situation that might be conceived. Rates and other contract provisions would be dealt with at the state level.

If the principle that there shall be no unnecessary duplicate regulation is accepted, there remains practically no reason for licenses for the use of government lands or navigable water to be concerned with anything more than bona-fide conditions which relate solely to the use of such lands or to the operation of substantial, not theoretical or inconsequential navigation.

Interstate Power Transactions . . . With respect to Part II of the Federal Power Act, which relates to interstate transfers of electric power, the business of interchange of power is extremely complicated, so much so as to almost defy exact analysis. In my opinion it will be necessary to get back to fundamentals. In the meantime the federal law should be modified to exempt emergency, economy interchange, and slop-over transfers involving interstate boundaries. It should be modified to exempt in positive terms the purchase of outstate energy for use within a state that is purchased at the state line or within the state where the power is consumed. It should also exempt sales at state lines or sales within a state to agencies transmitting across state line for sale without the state.

The foregoing are in my opinion the most important and significant provisions of federal statutes calling for correction. It will be a long, slow, and arduous task to bring them about. We must keep before us always the fact that our cause is just and that in all these things we are working not in the interests of greater profits to the companies but to secure the lowest possible cost of electricity to their customers.

What EEI Speakers Said

Is Local Government Losing Out?

DR. G. C. S. BENSON,
President,
Claremont's Men's College

- **US gets increasing share of national income in taxes at expense of state and local government**
- **Federal grants-in-aid extend national power and lessen state and local government**
- **Business and professional groups turn to Washington to get desired jobs done expeditiously**
- **Our nationally characteristic impatience at delay increases our reliance on centralized government procedures**

The division of powers between the federal and state governments in the United States is being re-examined for the first time in history by President Eisenhower's Commission on Intergovernmental Relations. Its report is going to the President at the end of this month and will very shortly be published.

America has traditionally been proud of its federal system of government. We have talked of states rights, identified ourselves as Texans or New Yorkers, and have rejoiced in our local differences and autonomies. We have viewed it as an important part of the American tradition.

In the last few decades, however, there has been a marked drift away from our traditional federal system. Although much of it came under the New Deal in the 1930's, portions of it came during Republican administrations including the present one. There seem to be several fundamental reasons for this drift toward centralization.

War and Taxes . . . First are the bad boys of the 20th century, war and taxes. Heavy national expenditures for defense have meant more national taxes, with state and local taxes becoming a smaller proportion of the national income. Accordingly, it is frequently argued that the national government must undertake a function because the states do not have the money to do it. There is some truth to the contention that states and localities need or find it easier to get national money for important functions. War itself has created the important argument that there is a national interest in many state and local government functions, notably Civil Defense.

Second to war and taxes is technology. As aeroplanes fly over numerous states in a few hours even state and local regulation of aircraft must follow a national pattern. A free moving economy probably has to have most of its economic regulation emanate from the government covering the entire free economic area.

Third, the national government has maintained higher administrative standards than the average state or local government. The high salaries paid national officials and the strength of national civil service make many business and professional groups turn to the national government for performance of a desired function.

Fourth, the major factor in the drift toward centralization is American impatience. We are an energetic people who want things done. As we meet in national groups, it is always easier to get action through Congress than through 48 legislatures.

Convenient Pegs . . . Two convenient pegs have served to carry a large mass of additional national authority, the interstate commerce clause in the Constitution and the power of the national government to tax and spend for the general welfare. Congress has vastly extended its control over state and local governments through the grant-in-aid device. Grants authorized by the present session of Congress will probably total $3-billion. If one adds to the federal amount a required matching amount, usually equal to the grant, we find that Congress is controlling at least 25% of state expenditures. If requests of various groups of state and local officials and interested citizens are followed, Congress will be determining half of state and local budgets within a few years.

Many grants serve very useful purposes, but raise some very difficult problems. First, there is the fundamental question as to how much grants may weaken the authority of the governor and state legislature. National grants weaken the governor much less when the state gives him adequate authority, which many states have failed to do.

Grants have had a considerable, sometimes a distorting, effect on state budgets, resulting in a kind of categorization of state expenditures which many states would not have made on their own and does not constitute good administration. Grant programs are uncoordinating, resulting in administrative disintegration within the states. Yet there is little substantial pressure against them.

Interstate Commerce Clause . . . I must concede that federal development is more justifiable under the interstate commerce peg, although it has probably been carried too far, as in statutory interpretations like those in the Phillips case. In the regulatory field, some citizens, legislators, and judges have taken the position that anything the national government may do, it should do. This dangerous doctrine results in extension of national activity beyond what Washington can reasonably undertake and restricts state and local policy making with resultant loss of decentralization.

A better approach would seem to lie in suggesting moderation on the part of the national government: it need not do everything it can do. Where it must act it should leave room for cooperative or independent state action. Frequently national action should lean on state law. Often the cooperative action of state agencies should be requested. The national government should, as in the case of insurance, give the states an opportunity to legislate where this is feasible.

Laws Should Regulate, Not Ruin

RICHARD JOYCE SMITH,
partner,
Whitman, Ransom & Coulson

- **Power industry can survive and continue to grow if the administrators of law were determined merely to regulate**
- **Congress may be ready to undertake a more comprehensive and courageous review of the whole relationship of state and federal controls**
- **Public Utility Holding Co Act of 1935 may be a pattern for such controls as it was enacted along with the new Federal Power Act**

Great debates on the regulation of public utilities in this country have usually followed in the wake of dramatic technological advances in a particular type of utility service.

As the stage was being set for the great debate of the 1930's, the gas companies, rather than the electric companies, produced the first inkling of the conflict. The beginnings of natural gas transmission produced several cases concerning the rights of the state commissions to control the transmitting companies, notably the decision of the Supreme Court in Missouri vs Kansas Gas Co, 265 U. S. 298. But decisions that gas transmission crossing state lines was immune from state control did not change the generally accepted view that the gas business was strictly a local enterprise. Those decisions were not considered to call for federal control of gas industry.

Federal Control of All Business . . . After the 1932 Presidential election, the discussions concerning the Couzens bill (to amend the Federal Water Power Act so as to give the Federal Power Commission extended authority over companies engaged in interstate transmission) were merged with the broader agitations for federal control of all business which had become the basic objective of the New Deal. This agitation culminated for the power industry in the Public Utility Holding Co Act of 1935.

It is interesting to note that even then with the trend for centralized economic control at its zenith, the new federal statute still was viewed as a supplement to, rather than a substitute for, state control.

The regulation of the interstate phases of the power industry was a part of a general governmental program which encompassed increasing control over all business. With the Tennessee Valley Authority introducing a new kind of *in terrorem* governmental competition; with the Rural Electrication Administration engaged in activities that were frankly directed toward an ever expanding sphere of public ownership; with members of the Public Utilities Division of the Securities and Exchange Commission seemingly dedicated rather to the dissolution than to the simplification of holding company structures; and to the dismemberment rather than to the integration of operating units, the reach of the FPC into the sphere of local electric utilities could not be considered exceptional.

Power Industry Has Survived . . . The wonder is that the power industry has survived this general attack. But survive it has and the question now is how can regulation be made more rational and less punitive in the years that lie ahead.

I have always believed that no matter how exacting might be the administration of regulatory laws, the power industry, because of its intrinsic resilience, could survive and continue to grow, if the administrators of the laws were determined merely to regulate and not to destroy.

The fact that local gas companies are now ready to rely on the FPC for protection against escalating charges in contracts between producers and transporters of gas, may go a long way to dispel the feeling that there must always be a cold war between the FPC and the local utilities. Likewise, the clearcut establishment of federal control over the rates charged for interstate transmission of power should convince both state commissioners and the industry that integration of both federal and state regulation is needed.

This integration, in my opinion, cannot be achieved under the highly technical claims of jurisdiction the FPC has made in the past. It must be based upon an acceptance of substance rather than form as a guide to jurisdiction.

PUHCO Act is a Pattern . . . Is there any pattern which might aid in Congress in seeking this integration? Strangely enough such a pattern does exist in the Public Utility Holding Act, which was enacted along with the new Federal Power Act in 1935. The declaration of policy in the act contained the general statement that "such federal regulation (is) however, to extend only to those matters which are not subject to regulation by the states." Such general declarations have not prevented the commission from extending its authority over local utilities.

The Public Utility Holding Co Act of 1935, on the other hand, established in its section 3 a clearcut statutory procedure whereby the SEC is required, unless it finds some supervening national interest to the contrary, to exempt from the regulatory requirements of the act intrastate holding company systems, companies that are only incidentally holding companies, temporary holding companies, and holding companies whose systems are outside the U. S. This procedure, in contrast to that in Title II, contemplates that the federal administrative agency charged with the regulation in question must make a quasi judicial determination of an application for exemption. It is given a power of exemption which, in the proper case, it must exercise.

What EEI Speakers Said

Utilities' Record Will Win Support

LOUIS V. SUTTON,
President,
Carolina Power & Light Co

- **Evidence shows American people are seeing through political and socialistic attacks on utility industry's magnificent record**
- **There is growing tendency on part of industry to fight for its rights and to tell its story to the public. This must be intensified**
- **Number of organizations devoted to socializing utility industry is increasing and their Washington lobbies becoming more active**
- **The industry must give wider support to agencies fighting its battles; must increase its advertising expenditures**

There is unmistakable evidence on the part of the American people that they are seeing through some of the political and socialistic attacks on our industry's magnificent record of achievement. My belief that a large majority of the public wishes to support rather than destroy free enterprise is based upon the premise that an informed public will render a fair verdict.

Our industry's record of achievement is without parallel in America or even in the world. Certainly a review of our record would lead to no other conclusion than that the industry which made that record deserves public support.

My belief that our record will win public support is not based upon a slackening of effort on the part of the public power group, who, with its predecessors, was responsible for the sale last year of the greatest number of kilowatthours of electricity from public power projects during any year in the history of the industry. Why then do I find encouragement?

There seems to be a growing tendency on the part of the industry to fight for its rights and tell its story to the public. That tendency though encouraging is not as prevalent as it should be and as, I am confident, it will be.

No doubt there is good and sufficient reason in the minds of those who do not support the industry's effort at the national level for believing that their company's best interest can be served by confining their efforts to their own service area. I do not share that belief. Action which threatened our industry was taken at the national level. If we win the fight against public ownership of our industry it will be won at the national level.

Some of us I am sure have reasoned that the best way to win friends and influence people is to dodge controversy. In my opinion, no company deserves public support which refuses to fight for its very existence. No company can long command public respect which refuses to defend itself. I am inclined to believe that timidity is in some degree responsible for many of our difficulties.

Experience which we have undergone during the past 20 years should teach us to recognize threats against our industry for what they are. It is a fact also that the public is beginning to see through the schemes which public power advocates use to camouflage their socialistic designs.

It becomes more and more apparent when reviewing the record that the TVA was conceived in deceit and subterfuge. Gordon Clapp, ex-chairman of TVA, admitted that the stated purposes of TVA were accomplished in 1945 and that its expansion since that time has been related solely to its continuing development as a public power agency.

Public power proponents do not even bother to mention navigation and flood control in their attempts to gain congressional approval for the Niagara development. It is an outright public power proposal. The same situation is virtually true of the Hells Canyon proposal. Not only has the Idaho Power Co proposed a more sensible plan for developing Snake River but the Idaho plan would cost only a fraction of the estimated cost projected by public power advocates.

I cite (this subject) to emphasize the fact that the public officials with socialistic tendencies no longer take the trouble to hide their plans behind a smoke screen of laudable purposes; next, to emphasize the fact that the record our industry has achieved, however magnificent, will not win public support unless we batten down the hatches and sail full speed ahead with blazing guns. Those who would destroy us are not pulling their punches—why should we.

I am informed on good authority that the number of agencies devoted to socializing our industry is increasing. Their lobbies in Washington are becoming more active.

As an industry, we are entirely too miserly when it comes to telling our story; yet no other industry is being besieged by so many destructive forces. What's the use of having a good story if we don't tell it? We don't need to exaggerate or make groundless claims. All we need to do is present facts based upon our record of achievement. Certainly that record justifies public support, but can we say we are making adequate effort to gain it?

The record on the subject is not as encouraging as it might be—especially as it relates to the electric utility industry. A recent survey made by the Public Utilities Advertising Association indicates that the electric utility companies across the nation are spending only 62 one-hundredths of one per cent of gross revenues for advertising.

Surveys of advertising expenditures by all types of industry usually place the manufacturers of soap, automobiles, cigarettes and razor blades among the top ten. Electric utility industry, if listed at all, is near bottom.

If we wish to maintain our free enterprise system, we must speak out fearlessly against those who, with phony schemes and dishonest procedures, would lead us to destruction.

Free Enterprise Is Interdependent

H. C. McCLELLAN,
Chairman,
National Association of
Manufacturers

- **Forces of socialism made greatest penetration in power industry, traditionally an exemplar of free enterprise**
- **TVA was sold to the people under the guise of navigation and flood control, and later as "yardstick"**
- **People failed to recognize socialism, and hard-pressed industries failed to rally behind the power industry at the first onset**
- **Free enterprise only recently began making some recoveries against the intrenched federal monopoly**

From its beginning in the last quarter of the 19th century, the electric light and power industry has been a living example of the American philosophy of freedom—freedom that permits the exercise of personal abilities and ingenuity consistent with the rights of others. This tradition made possible the first company concerned with electric power supply which was organized solely on the basis of faith in one man's ability. Thomas A. Edison foresaw the elements of an electric light and power system, but did not have enough money to develop it. The money put up by investors in the Edison Electric Light Co enabled him to continue his work.

It is ironic that in the field of Edison's first and greatest triumph, the forces of socialism have made their greatest penetration. Ironical, yet understandable. In generating and marketing a product that is a public utility, private companies early in the industry's history suffered inroads by municipalities eager to take over. Yet electrical development traditionally has been free private enterprise. Never did public ownership represent more than 6% of generated power until the early '30's.

TVA, the federal government's first great invasion, was a "depression baby." It was originally a "make-job" project, supposed mainly to have to do with development of navigation and flood control. Its alteration into a power project was put across on the taxpayers. In those days the so-called power giants were handy targets. Backers of TVA took pains to explain that they were opposed to monopoly and bigness; that TVA power plants were being built simply to provide a "yardstick." To make their yardstick work they had to eliminate a private utility system.

Other Fronts Expanded . . . I seem to recall that your industry based its pleas for help on the interrelationship of private interprise. "If the government takes over power," you said, "it will be able to do the same in other industries." Though the pleas did not fall on deaf ears, they brought few fresh recruits. Other industries were having their own government troubles.

Those fronts have expanded. Today Uncle Sam is the largest landowner, the largest insurer, the largest lender, the largest landlord, the largest tenant, the largest warehouse operator, the largest shipowner, the largest truck fleet owner in the world.

When the Eisenhower Administration took office it launched efforts to eliminate federal enterprises competing with private business. It also set out to appraise the extent and justification of government enterprises of this character. Directives were issued by departments; bills were introduced in Congress.

US Pulls Out Further . . . Secretary of Defense Wilson has made progress in taking defense agencies out of private business. Under the leadership of Secretary of Commerce Weeks the federal government was able to dispose of government-owned barge lines which, after 30 years of government operation, had such a dismal annual balance sheet that the secretary's ability to find a private buyer was considered a stroke of genius. The very first year of private operation found the lines out of the red for the first time. More recently, 24 of the 27 government-owned synthetic rubber plants were sold to private concerns. In both branches of Congress Republicans and Democrats alike supported the move.

While Mr. Eisenhower succeeded in getting the government out of some fields, TVA is branching out, its latest activity being the production of diammonium phosphate in competition with the fertilizer industry. Among the Hoover Commission's recommendations last month was one that TVA end all chemical research. It recommended that its fertilizer research be transferred to the Department of Agriculture and that the price of TVA-produced fertilizer be raised to cover "all costs" including the loss of taxes obtainable from private industry.

What Made Inroads Palatable . . . But the government, through TVA, now is in the power-generating business, power distribution business, fertilizer business, transportation business, construction business, and housing business. And some of these enterprizes are hundreds of miles from TVA damsites.

To my mind, two factors are responsible for the inroads of government on business. One is the timing of socialistic schemes amidst the depression. Second is the failure of the American people to recognize a rampant form of socialism was being introduced. Every day advocates of government ownership only wanted to set up just one "pilot plant" to prove how cheaply electricity could be produced when it was taken away from those "bloated capitalists. This pilot-plant dodge came to be referred to as the "yardstick." They called TVA the yardstick for electric power. Really, TVA was the yardstick for socialism.

What EEI Speakers Said

Air Conditioning—Big Business

C. A. TATUM JR.,
President,
Dallas Power & Light Co

- Home air conditioning retail sales were $2 billion in 1954 and will be 2¼ billion in 1955
- Air conditioning spreads beyond "hot areas"
- Increasing residential-area load densities create distribution problems
- Load factor now closer to 20%, and air conditioning has diversity worth considering in planning plant capacity
- Residential load increases call for adequate home wiring

Since the end of the war, air conditioning, especially for the home, has become big business. It will become bigger business. Retail sales volume for 1954 was estimated at $2 billion, and a $2¼-billion sales year was forecast for 1955. Sale of room air conditioners alone totaled 1,230,000 units in 1954, a 515% increase in four years, and national saturation is still only 5%. The Bureau of the Census, reports from manufacturers, and industry opinion indicate that the 10-million kw of weather-controlled load served by the utility industry in 1954 will grow to more than 55-million kw by 1963.

We are seeing air conditioning spreading beyond the "hot areas." In 1950 the Middle Atlantic and East North Central regions accounted for 18% of total sales of room air conditioners. By 1954, these regions accounted for 37%. This compares with 22% in 1950 in the East South Central and West South Central United States in 1950 and 33% in 1954. Electrical Merchandising magazine states that every region, except New England, registered gains in 1954. The biggest increase was in the West North Central area where the figure more than doubled. An American today is the most comfortable person in history, and has a habit of making a luxury a necessity.

Residential developments featuring $15,000 homes with air conditioning are no longer news in the Southwest. They are simply an answer to volume demand for year-round comfort. While the air conditioned city may be far in the future, the air conditioned shopping center is just ahead in our area.

Big Business for Utilities . . . Air conditioning is big business for every utility. Careful consideration must be given to location of new plants closer to residential areas. Increasing load densities in residential areas are creating new distribution problems. In Dallas it is no longer practicable to serve such loads from distribution substations spaced at commonly accepted intervals. Additional substations have been required with the attendant problems of obtaining substation sites in built-up residential areas and routing transmission lines there.

Some reduction in the cost to serve air conditioning loads will result from steps recently taken to increase the power factor to between 85 and 90% on the new models of room air conditioners. But distribution facilities must still be greatly increased, and we are designing the distribution system in residential areas to serve an average load density of 10,000 kw per sq mile.

For many years the Dallas system peak has come at about 3 PM, but as residential air conditioning load grows the system peak tends to move farther into the evening. For companies with a winter system peak, air conditioning is a very favorable load. If the residential customer who used the national average of 2,549 kwhr per year were to buy a 1-hp air conditioner and use it for 1,000 hr a year on a system having a winter peak, his annual use would increase 29% without additional generating capacity being needed.

Ranges, water heaters, and laundry equipment are good balancing loads for companies with a summer peak. The heat pump appears to offer tremendous opportunities to offset high summer peaks due to refrigeration loads. Here is a device which, fully developed and mass produced, can be installed to a high point of saturation without increasing generation peaks or required capacity.

Load Factor Now Close to 20% . . . When we had a relatively small air conditioning load we assumed that it had an annual load factor of around 8 to 10%. But a recent study determined that the load factor of air conditioning today is closer to 20%. Our study showed that customers get the habit of air conditioning and tend to keep equipment running. It showed also that air conditioning has a diversity worth considering in planning additional plant capacity. A group of 1-hp air conditioners will have an average demand of about 1,500 w per unit, but at the time of our system peak last year on a 103 F day in July, this demand was found to be 1,000 w or less per unit, indicating only 67% of the maximum undiversified load was on our system peak.

Central systems showed an average load of 1,300 w per hp of rated capacity. The demand of such units at the time of annual system peak was only 1,000 w or 77% of maximum. Air conditioning has brought some unexpected benefits. The residential customer has become accustomed to paying a much higher service bill. During August 1954, more than 3,600 of our residential customers used in excess of 2,400 kwhr for that month alone.

Perhaps one of the most important of its benefits has been in the home-wiring field. Air conditioners of ¾ hp and over should be served with 240-v circuits. Because of the heavy increase in air conditioning and other appliances, we are recommending that no home in Dallas have less than a No. 2 service entrance and a rating of service equipment not less than 100 amp.

Utility Gains Seen in Rehabilitation

ELMER L LINDSETH,
President
Cleveland Electric Illuminating Co

- **Program of American Council to Improve Our Neighborhoods is praised; utilities urged to support its objectives financially**
- **Of nation's 50 million homes, only 7 million are in first class condition; vast majority are obsolete electrically**
- **Utilities can gain $300 million annual revenues, and appliance dealers $2 billion increased sales, with only 10% of homes improved**
- **Two-car families cited as lesson in striving for greater appliance sales to improve living standards**

The objectives of ACTION (American Council to Improve Our Neighborhoods) are of tremendous importance to the electric utility industry.

Of this nation's 50 million homes, only 7 million are in first class condition. The remaining 43 million are in some degree sub-standard. Eight million are actually in slum or near-slum condition.

Electrically speaking, the vast majority of America's homes are obsolete. Measured against the living standard which modern appliances make possible, the number of sub-standard homes is truly alarming.

Twenty-two million American homes have ranges over 15 years old. More than 45 million homes lack clothes dryers of any kind. Some 25 million do not have automatic water heaters, either gas or electric. Over 40 million are not just inadequately, but poorly lighted. Twenty-one million do not even have wiring that would permit the use of these improvements.

According to a recent survey, 42% of all homes have only two-wire, 30-amp entrance capacity.

Yet this is only part—although an important part—of the sorry housing picture our industry must help set right if our business is remotely to approach our market potential.

And let there be no mistake about the great and growing importance of residential usage to utilities. Just 10 short years ago, residential customers accounted for only 15% of all electric energy sold. Last year, that percentage was 26. This is a tremendous increase in just one decade—a greater increase than for any other class of customers. On a revenue basis, it is even more impressive. Residential sales in 1944 totaled $1.1 billion; in 1954, they were $2.9 billion—an increase of 160%.

These figures show what has happened despite our severe bottlenecks of inadequate wiring, the general sub-standard condition of housing, and a nationwide apathy regarding home improvement. The results of the past decade are only a fraction of what we can attain if we really organize to tap the potential I have mentioned.

To gauge that potential, let's make the conservative assumption that ACTION, in its efforts to raise all American housing to even modest standards, acomplishes only 10% of that objective.

That 10% success, combined with good sales promotion on our part, can add to our lines 2 million additional electric ranges, 4½ million additional electric clothes dryers, and 2½ million additional water heaters.

For the appliance industry this adds up to about $2 billion in increased potential sales. For the utility industry it means some $300 million annually in increased residential revenues beyond what we can otherwise expect.

We can scarcely imagine the possibilities if we reach 20-50-100% of the goal in the residential field, to say nothing of the collateral commercial and industry benefits.

Millions of homes today do not enjoy even the barest minimum of electrical living.

In part, this failure is due to the fact that those homes are inadequately wired. Even more disturbing is the fact that of the homes being built today—and this is largely the fault of the utility industry—20% have an entrance capacity of 30 amp or less.

In part too, many houses lack electrical conveniences because our selling campaigns fall on unreceptive ears.

For example, millions of Americans have cheerfully spent $2,500 or more on a new car, while their homes lack an adequate range, a water heater, automatic laundry equipment, or even the barest minimum of adequate lighting. And 4½ million families today own not just one, but two cars. The average income of these families, many of whom would claim they cannot afford a new electric range or dryer, is slightly over $7,000 a year. The automotive industry estimates that by 1960, the number of two-car families will exceed 7½ million.

Certainly what we have to sell is closer to home, and means more in better living standards than the automobile, important though that may be.

ACTION has a program that can help us. ACTION offers our industry a unique opportunity to work with other interested industries and with civic and professional organizations in a coordinated broad-scale campaign. Rehabilitation is their concern. It is also our concern. By pooling our efforts with theirs, we can multiply results.

Specifically what should we do, you and I?

First and foremost, let's each of us get informed—become literate—about the whole vast and complex problem of decayed and decaying neighborhoods.

Second, let's publicly endorse ACTION and its objectives—personally, and in name of our companies.

Third, let's give all possible publicity to ACTION.

Fourth, let's motivate our associates and our employees to take leadership in rehabilitation projects in our areas, and to integrate those projects with the nationwide ACTION campaign.

Fifth, let's give ACTION wholehearted financial support.

High Voltage Is A Good Investment

PHILIP SPORN,
President,
American Gas & Electric Co

- **Higher transmission voltages restore capacity balance between generators and lines; avoids high R/W costs; cuts basic transmission cost**
- **Unexpected radio interference plagued early 315-kv lines**
- **Design changes, conductor aging and care in stringing cut RI at 330 kv**
- **Operating experience good on some 400 miles of 330 kv now in use**
- **Loadings of 345 Mw per circuit attained; 500 Mw feasible at 345 kv**
- **Capabilities bring savings that make EHV a prudent investment**

In 1946 it became evident that existing transmission voltages, particularly 132 kv and below, would become inadequate within a few years.

High voltages were necessary in order to:

1. Restore flexibility and balance between capacity of individual generator units and transmission circuits.

2. Avoid excessive costs and difficulties in securing the multiplicity of rights-of-way for continued expansion.

3. Reduce the basic cost of transmission.

On the American Gas & Electric system a substantial increase in capability could have been attained by adopting either 230 or 287 kv, already in use. We concluded however, that we needed a higher voltage. To determine what the new voltage should be and arrive at a design in which all pertinent factors would be evaluated, we projected a basic research program, including a full scale field line installation. With the whole-hearted cooperation of several manufacturers the Tidd 500-kv test project was set up.

The Tidd tests showed that RI, rather than corona loss would dictate conductor diameter. Economic studies brought out the decided cost advantages of double-circuit line. Decisive factors in the design narrowed to:

1. The highest voltage for which double-circuit construction appeared practicable.

2. A voltage for which the conductor diameter needed for RI would not be excessive for sleet melting or handling.

3. An insulator string length not excessive for hot-line maintenance.

All considerations led to an initial choice of 315 kv nominal (330 kv maximum) 1.6 in diameter 1,272,000 circ mil expanded ACSR conductor, 18 5¾-in. line insulator units and a transformer BIL of 1,125 kv. Bundled conductors were ruled out at the time because of sleet melting and maintenance.

Unexpectedly high levels of radio interference were experienced when a 50-mile section of line was stepped up to a voltage of 340 kv in October, 1953.

Conductor System Boosted . . . An immediate review of the RI situation led to a decision to increase the conductor diameter, particularly for the impending OVEC lines, from 1.6 to 1.75 in., giving a greater RI margin. Conductivity was increased about 11% above the old conductor. At the same time, line hardware, sleevs, joints, etc., were rechecked in the laboratory for RI characteristics, modified where necessary, conductor manufacture and handling methods were improved, more rigid inspection procedure was adopted, and both wooden horses and tension equipment were used in stringing new lines to avoid abrasion of conductors.

Construction of lines with 1.75-in. conductor was started early in 1955. Today the entire OVEC transmission system, approximately 400 miles of double-circuit lines, is in service at 328 to 330 kv.

An encouraging experience occurred this spring when the original Sporn-Kanawha line which had been strung with the same batch of contaminated 1.6-in. conductor that had given trouble in 1953 on the Sporn-Muskingum River line, was energized at 330 kv. Apparently conductor aging, even under reduced voltage (132 kv) operation, was sufficiently effective to bring 330 kv RI to satisfactory levels. Hence this line was left in operation at 330 kv.

Operating experience to date has been good, although lightning flashovers have somewhat exceeded predictions. During a sleet season ice was melted successfully on one 330-kv line section. On another section, where melting current is not available, dancing conductors caused a rather prolonged outage, thus emphazizing the importance of sleet melting procedure on 330-kv lines.

Looking Ahead . . . In the light of the rate of growth of utility loads, over the coming 20 to 25 years, there is an urgent need for utilities to plan for greatly increased capacity for power transmission.

How well 330 kv can meet this future challenge may be judged by considering the capability of a typical 135-mile line. For this distance and assuming eventual operation at 345 kv, loadings of 500 Mw on one circuit or 1,000 Mw on a double-circuit line are feasible. In the short period of service that 330 kv has had on the AGE and OVEC systems integrated loadings of 350 Mw per circuit have actually taken place. If a twin-conductor, double-circuit design should be adopted—an attractive possibility from the standpoint of RI characteristics—the capabilities would be increased by 25% to 625 and 1,250 Mw, respectively.

We have reached a stage today on many systems where the facts are so clear that management and technicians together should be able to discern that higher voltages are essential. This is a time when it is the job of management to give the engineers a policy that will enable the technicians to begin to plan, to build and to operate the transmission that will be needed tomorrow and the years ahead.

Utilities Seek Added Efficiency

R. G. RINCLIFFE,
President,
Philadelphia Electric Co

- **Average heat rate has decreased to approximately 12,000 Btu per kwhr while efficient plants are approaching 9,000 Btu per kwhr**
- **Philadelphia Electric's new supercritical pressure plant will have a heat rate of 8,000 Btu per kwhr while producing 325,000 kw**
- **Designers will rely on Monotube boiler design, demineralization, and super-alloys to solve problems of supercritical pressure plant**

The tremendous increase in the nation's power requirements in the years ahead will greatly intensify the electric light and power industry's drive toward more efficient power generation. Over the years, as we have seen, our industry's efficiency has continually improved. We have decreased our average heat rate to approximately 12,000 Btu per kwhr, and our most efficient plants are now approaching 9,000 Btu per kwhr.

The next step—the essential forward step in power generation—is supercritical operation.

Supercritical Operation . . . Philadelphia Electric is building a new generating station which will house the world's largest and most efficient turbine generator. A cross-compound unit to produce 325,000 kw at a rate of 3,450 kwhr per ton of coal! The heat rate will be 8,000 Btu per kwhr, an improvement in performance of 750% over the old Edison station! The steam will be used at record high supercritical pressure and temperature of 5,000 lbs and 1,200 F.

Let us consider "supercritical pressure".

First we must bear in mind the physicist's definition of the "critical point". It is simply the pressure and temperature of a substance at which the densities and other physical properties of the liquid and gaseous states are identical.

As everyone recognizes, the volume of 1 lb of steam is far greater than the volume of 1 lb of water that yielded the steam. As pressure and temperature are increased, the volume of the saturated steam decreases progressively faster, while the volume of the water increases only slightly, until at the critical point, the volumes are identical. Beyond the critical point, at supercritical pressures, the volumes remain identical, steam and water having the same density.

Monotube Generator . . . Design-wise, what does this mean? First to be considered is the conventional boiler system, consisting of a boiler drum connected by tubes to its water supply drum. When heat is applied to the tubes, the water temperature is raised and the water starts to circulate. Steam forms in bubbles in the tubing and is collected in the drum.

In supercritical operation, using the Monotube, once-through steam generator, water is circulated by the pumps at very high pressure. As heat is applied, the water temperature increases, and when it reaches the critical point, steam is formed almost instantaneously without boiling.

New Considerations . . . This system involves several new considerations. One is the removal of the minute quantity of impurities from the water, because there is no place in the boiler system for blow-down. The solution of this problem, which is the use of water practically free from impurities, is commercially available in the form of a demineralizer, through which about one-third of the total water flow of the system constantly circulates.

The water from the condenser, with its small quantities of impurities, enters the demineralizer, flows through the anion and cation resin, where it gives up its negative and positive particles before being returned to the system in a pure state. It is so pure that in the presence of even minute quantities of extra oxygen, it becomes corrosive.

Metallurgical Problems . . . Just as people have characteristic personality traits, so do metals. In the choice of metals for this system, we are concerned principally with the elevated temperature rather than with the pressure.

At the turn of the century, cast iron had a perfectly satisfactory "personality" for use at the then-current maximum temperature of 450 F. By the time higher temperatures were needed, the carbon steels were ready to take over the job and give a good account of themselves at temperatures up to 750 F. Then low alloy steels, containing small amounts of chromium and molybdenum, made it possible to design and operate at temperatures in the 1,000 F range. At the 1,200 F temperature used with this supercritical operation, however, none of these alloys have the right "personality." Literally, they "can't take it". So again, with the help of the metallurgist, we are turning to super-alloys containing relatively large quantities of chromium and nickel, and small amounts of stabilizers, such as columbium and molybdenum.

Turbine Design . . . A look at a conventional cross-compound cycle will help to indicate why the elevated temperature of the super-pressure system is not so critical a problem as it might first appear to be.

Basically, the only change in the conventional system required for this super-pressure operation are the steam generator design incorporating the Monotube principle and including a second stage of reheat for greater efficiency, the addition of a small super-pressure turbine, more feedwater heaters, and two more boiler feed pumps to provide the necessary extra-high pressure.

Industry Assumes Atom Leadship

EDGAR H. DIXON,
President
Middle South Utilities, Inc.

- Atomic Energy Act modification opens door to industry
- Participating organizations number 71, including 45 utilities, 10 manufacturers
- Private capital finances industry's participation
- Total industry proposals involve nearly $180 million
- Nuclear plants will be built as nuclear fuel costs level off with conventional fuel costs

Hardly a day goes by that one cannot find in his daily newspaper an article concerning some new atomic development—discovery of some new use of the atom or the declaration of a company's intention to enter the field. It may announce that an electric utility company plans to construct a power reactor or join in such a project. Last year's modification of the 1946 Atomic Energy Act encourages industrial participation, and American industry has responded wholeheartedly.

Although farsighted individuals and companies thought of peacetime industrial use of atomic energy in the 1940's, industry became seriously interested in 1950. Then AEC received inquiries looking toward the design and construction of nuclear reactors with private capital and their operation by industry. By July, 1951, agreements with AEC had been signed by four study groups—Union Electric Co of Missouri and Monsato Chemical Co; Detroit Edison Co and Dow Chemical Co; Commonwealth Edison Co and Public Service Co of Northern Illinois; and Pacific Gas & Electric and Bechtel Corp. These studies were financed entirely by the companies, except for costs incurred by AEC.

Utilities Lead . . . Latest figures indicate 71 organizations are participating in study agreements with AEC, including 45 utilities, ten equipment manufacturers, nine engineering and construction firms, five chemical companies, and two shipbuilding companies. AEC estimated that through December 1954, study groups had spent more than $8 million, some 20 times as much as AEC on this phase.

AEC's 1953 invitation to participate in the design, engineering, construction, and operation of the pressurized water reactor brought nine firm bids. Duquesne will spend about $30 million during construction and initial five years of operation. Last year, 18 bidders responded to AEC's invitation to design, build and "test-operate" the prototype of the Army Power Package Reactor. The bid of some $2 million by American Locomotive Co won, and a lump-sum contract was awarded that company.

Before the Atomic Energy Act was modified, strong objections of a small but vocal group had to be overcome. This group insisted atomic energy was properly a federal monopoly. By and large members of the group would like to see a federal monopoly of the electric power industry.

Con Ed Reactor . . . On February 10, 1955, an important milestone was reached. H. R. Searing, president of Consolidated Edison Co of New York, told the Joint Congressional Committee on Atomic Energy that his company would apply to AEC before April 1 for a license to build and operate a private power reactor facility near New York City. This application has been submitted and the company is moving ahead with its plans.

Con Ed awarded a lump-sum contract to Babcock & Wilcox whose proposal appeared most attractive for construction of the reactor and steam generators. The plant, scheduled for completion in about five years, will have an electrical capacity of 235,000 kw and cost $55 million. The reactor is to be a pressurized water thorium-uranium converter. Cost of power from the plant is expected to approximate the average cost of power in the Con Ed system.

The Nuclear Power Group, consisting of Commonwealth Edison Co, American Gas & Electric Service Corp, Bechtel Corp, Pacific Gas & Electric Co, and Union Electric Co of Missouri proposed to AEC that it be permitted to construct and operate, entirely with private funds, a 180,000-kw boiling water reactor near Chicago. Central Illinois Light Co and Illinois Power Co have since joined in this proposal, and General Electric has contracted to build the plant for $45 million by 1960. About one-third of the cost will be shared by all participants as research and development expense.

Detroit Edison Proposes . . . Detroit Edison Co and nine associated utilities have made a proposal to build a 100,000-kw fast-breeder reactor in the Detroit area, at an estimated cost of $54 million, $45 million of which is for the reactor. The Yankee Atomic Electric Co, formed by New England utilities supplying 90% of the electric requirements of six states, has proposed building a light water moderated and cooled reactor plant of 100,000-kw capacity in western Massachusetts. Monsanto Chemical is working with the group in planning and designing a $20-$25-million plant.

Estimates of proposals made since February, 1955, by private companies total nearly $180 million. Through the courageous efforts of some colleagues our industry has demonstrated that we are not going to wait to build power reactors until the technology has advanced to where nuclear power is as cheap as conventional power. Nuclear power should become a dynamic force, coming into ever increasing use as it begins to approach the cost of conventional power in various areas of the country.

Shippingport Seeks Nuclear Facts

PHILIP A. FLEGER,
Chairman of the Board,
Duquesne Light Co,

- Design incorporates flexibility to advance nuclear power technology
- Primary objective is to provide basis for estimating future costs
- Power production cost of plant is not expected to be significant
- Project will provide experience to design efficient nuclear plants
- Control centered in one room for reactor, turbine-generator and electrical equipment, will be tested for utility load pickup and rejection
- Operating experience will guide manpower training for future projects
- Atomic power plant excavation completed; construction starts soon

The story of Shippingport is your story as well as ours. Although the plant will be owned jointly by the government and Duquesne Light Co, the industry is to own with us the knowledge that is gained from it. The industry is to share in the dividends of answers to problems solved.

Shippingport is the result of an important decision—that development of nuclear power be advanced from the laboratory to full-scale construction and operation. Selection of the pressurized water reactor was governed by two factors; first, it was the only type ready for full scale construction and, second, development of all types of reactors would benefit from construction and operation of a full scale plant.

Shippingport is being constructed to advance nuclear power technology generally. The entire plant is very flexible. The reactor will accommodate additional cores of different types and larger size. Multiple components are being made by a number of manufacturers using different designs. And materials of various kinds are being used.

Such flexibility will substantially increase the cost. But the larger investment is fully justified by the additional knowledge that will be gained. We have much to learn before we will know how to build nuclear power plants that are competitive with conventional plants.

One of the primary purposes of building the Shippingport plant is to provide a firm basis for estimating costs. In developmental plants, constructon costs reflect many things which have been embodied for research and development. The relatively high cost of components manufactured on a non-tooled basis will also be a distorting factor. True construction cost will be further obscured by subsidies from firms desiring to be associated for knowledge and prestige. Initial operating expenses will be inflated by lack of experience, insufficient knowledge of safety requirements, and testing. And they will also include charges for depreciation based on estimates which may not prove realistic in the light of experience.

Production Cost Not Significent . . . The actual cost of electricity produced by developmental plants such as Shippingport will be of no significance whatsoever. But knowledge gained from these plants will make it possible to estimate the cost of constructing and operating plants of the same type on a non-developmental basis and the cost at which such plants can produce electricity. These estimates will present difficult questions, especially as to the life of various elements in the reactor portion and the proper amount to set aside each year for their depreciation. But reasonable accuracy should be attainable after several years' operating experience.

The beginning of test operations at Shippingport was originally scheduled for mid-1957, but manifestly the schedule is tight. Excavation has been completed and large scale construction is about to get underway.

The entire plant, including the reactor, is designed to meet inherent requirements of the Duquesne Light system as to rates of load pickup and rejection. Overall control will feature ease and simplicity as necessities for safety and dependability. A single control room is planned in which operation of the reactor, turbine-generator, and electrical equipment will be concentrated. The reactor will produce at least 60,000 kw net electrical output. The turbine-generator will have maximum capability of 100,000 kw.

Will Provide Design Data . . . Shippingport will provide valuable information on pumps, primary piping, heat exchangers, and other things peculiar to the pressurized water reactor. But it will also supply much information of importance for almost any type capable of producing heat for the generation of steam for electric power. As to heterogeneous reactors, Shippingport will help to determine design, methods of fabrication, life and cost of fuel elements. Of great importance will be experience with respect to the ability of different fuel elements to withstand long periods of irradiation and use. Also we shall learn about the effect of fuel element failures on maintenance and replacement of parts other than the core.

For both heterogeneous reactors and homogeneous reactors, Shippingport will provide information on radiation levels, and maintenance of radioactive equipment. Knowledge will be gained about control; not only the instruments but also the actual inherent behavior of the reactor. This involves changes in core reactivity, both short-time and as affected by aging, which must be coordinated with load changes arising in the particular system of which the plant is a part. Operating experience will develop practices for dependable service and for safety. Valuable information will be gained from emergency problems, such as scram, loss of auxiliary power, loss of coolant flow, and other mechanical and electrical failures.

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Shippingport Seeks Facts

(*Continued from page* 103)

Includes Manpower Training . . . Operation of Shippingport will also aid in determining manpower requirements of nuclear plants. A preliminary manpower schedule has been established and training of personnel will be started about two years before initial test operations.

Shippingport will be a university, so to speak, for the electric power industry of this country, for the free nations of the world and, within limitations of national policy, for countries behind the iron curtain as well. It will develop advanced technology at government expense. It has already served to stimulate other groups to undertake developmental power projects. It is a natural and logical step in an orderly transition from the complete government monopoly produced by military requirements of World War II to development of the atom for industrial purposes by private business under regulatory supervision. The government is committed to developing nuclear power as rapidly as possible, and if private industry does not undertake development the government is prepared to.

Rehabilitation of A-Fuel Is Vital

J. CARLTON WARD JR.,
President,
Vitro Corp of America

- **Rehabilitation of partially spent fuel is "forgotten area"**
- **Only AEC has rehabilitation information now**
- **Problems will come into focus with large-scale power production**

The "forgotten area" in nuclear power development is the rehabilitation of partially spent fuel. I want to impress on you that it is not too wise to sweep this problem under the rug without proper consideration.

The chemical separatoin of usable nuclear fuel from the deadening effects of other fissionable material is one of the little-known keys to economic power production. It is a complex and possibly an expensive process that must be given proper consideration in appraising the economics of power production from nuclear sources.

At present most of the information on rehabilitation of nuclear fuel elements is in the hands of the AEC. Only Vitro is operating a non-government processing plant, but even that is devoted to government work.

Many of these problems of fissionable products resulting from the reactor process will come into focus only when there are large-scale nuclear power plants actually in operation.

Learn First From Small Reactors

DR LAWRENCE R. HAFSTAD
Director, Atomic Energy Div.
Chase National Bank

- **More to be gained by building 10,000 kw reactors than 100,000**
- **Development of small reactor market abroad is pressing reason**
- **Foreign demand for nuclear plant is bright hope for nuclear market**

Industry can gain more experience today from building several small reactors of the order of 10,000 kw capacity than it can from building one large capacitor of 100,000 to 200,000 kw as is now being proposed by various industry groups.

One of the more pressing reasons for supporting a program for small reactors is because of their possible sale in foreign markets. For that reason, manufacturers should keep a keen eye on the foreign demand for nuclear power plants since that is one of the brighest hopes for early development of the nuclear power market.

Eight Important Points . . . In any broad review of the present nuclear power situation these several points should be taken into account:

1. Nuclear fuel costs are calculated to run roughly about 25 cents per million Btu.

2. Insurance problems relating to Nuclear power reactor construction may call for an amendment to the atomic energy act enabling the Federal government to underwrite a part of the larger accident risks involved.

3. President Eisenhower's "Atoms for Peace" program is tremendously popular in several foreign companies that I have just visited.

4. There is much confusion in estimates of nuclear power production costs arising mainly from the practice of announcing hoped for rather than actual costs

5. Development costs of nuclear reactors are bound to be high but consider that some $1.5 million was spent by a single company to develop an electric blanket and $7-10 million was required to develop a garbage disposer.

6. Suppliers will need a big market if they hope to turn out machinery and equipment on an economical basis. Part of the demand will come from government sponsored programs, part from industry sponsored programs and part from foreign programs.

7. Industrial firms interested in exploiting nuclear energy should enter access agreements with AEC in order to obtain classified information.

8. The AEC sponsored power reactor demonstrations program is a tremendously important step on the part of the government.

Far West Growth Makes History

JAMES B. BLACK,
Chairman
Pacific Gas & Electric Co

- **Industry and home building keep pace with postwar population growth**
- **Utilities add nearly 1,400,000 electric customers, and energy sales and area load have more than doubled**
- **Utilities' ownership vested in more than 386,000 stockholders, a 142-000 gain in nine years**
- **Federal power adds only 300,000 kw installed capacity while investor-owned utilities add 2½ million kw**

The postwar rate of population increase in Arizona, Nevada and California has been more than half again as fast as that of the country as a whole, while California in a single decade jumped from fifth to second most populous state. Its gain for the 12 months ending July 1 is estimated at 560,000, and optimists place it first among the states in population by 1965.

This record growth naturally brought about substantial changes in our economy. Agriculture retains its top position with an annual value in the three states of $3 billion, but has made way for a balanced economy marked by large and growing industry. During the postwar decade, residential construction represented about 17% of the national housing construction for less than 8% of the national population. Houses now cover tens of thousands of acres of former farm land. The West now has a population large enough to support all types of commercial and industrial enterprises. A growing steel industry is established, and our aircraft and electronic industries can be counted among the leaders of the nation. New commitments were made throughout California, Arizona and Nevada during the last year alone for more than 1,200 new plants and expansions totaling almost half a billion dollars. Since World War II our investor-owned utility companies have added nearly 1,400,000 electric customers, about a two-thirds increase in nine years. Kilowatt-hour sales and the area peak load, to which both investor-owned and other systems contributed, have more than doubled since the war. Last year area sales reached a level of 38 billion kwhr and the area peak load served was 8 million kw.

In nine years more than 5-million kw of dependable capacity has been added in our region. Last December the total dependable capacity in the three states was nearly 10 million kw, double what it was at the end of the war. Construction planned for completion before 1960 amounts to more than 5 million kw additional. Construction on such a scale could not have been undertaken without the confidence of both individual and institutional investors and the assistance of the investment bankers. Investor-owned companies of this area have been almost constantly in the market for new capital. Together we have spent a total of nearly $2 billion on electric plant since the war, and to finance this construction have successfully marketed nearly $1½ billion of securities.

Local Ownership Characteristic . . . At the close of 1954 ownership of the companies was vested in more than 386,-000 stockholders, a gain of 142,000 in nine years. A high degree of local ownership of stock is characteristic. Nearly two-thirds of Pacific Gas & Electric Co's 217,000 stockholders are Californians and own about half of our outstanding stock.

Government power zealots have sought to foster a belief that in our area we must be dependent in a major degree on government hydroelectric projects to supply demands for energy. The record of the industry here refutes this claim. In my own company's service area, the federal government from 1945 through 1954 added only 300,000 kw of installed capacity. In the same period we have installed 2½ million kw in an expansion program on which we have spent for all purposes $1½ billion. In terms of total capacity, our system alone has almost double the kw installed in federal plants in the Central Valley and Colorado River developments combined. Historically, we have been known for our hydroelectric developments, and at the end of World War II the area had twice as much dependable hydroelectric capacity as it had in steam. Today steam capacity exceeds hydro by over a million kw.

Steam Plants Rise Faster . . . We have turned to steam partly because steam plants could be built more quickly to meet rapid growth in demand. While steam plant efficiencies have been steadily rising, the quality of remaining hydro sites has progressively declined.

In the past 15 years, irrigated acreage in Arizona, California and Nevada has increased by more than one half, primarily through electric pumping. In California nearly three quarters of all irrigation water is electrically pumped. Underground water tables have dropped markedly and it is recognized that pumping is an inadequate answer to the increasing problem of supply. The most comprehensive development of water in California can be achieved if our government and private agencies share the financial burden by becoming working partners in these projects.

Construction of Hoover Dam on the Colorado River marked the entry of the federal government into large multiple-purpose water development projects in the West. Full realization of the potentialities of the West will require continuing development by the federal government as well as by state and local agencies.

The investor-owned utility companies of California, Arizona and Nevada paid a total tax bill last year of $138 million on their electric properties alone.

What EEI Speakers Said

Our Industry Faces Critical Years

- Partnership plan may solve Northwest power requirement problems
- Northwest utilities accept the challenge offered by the partnership plan
- But small political blocs threaten to destroy private incentive
- Their propaganda will probably increase
- Utilities must make greater effort to tell public about creeping socialism in our national life

KINSEY M. ROBINSON,
President,
Washington Water Power Co

The electric industry is passing through an extremely critical span of years.

Five years ago three major utilities in the Pacific Northwest were earmarked for the collectivist drainpipe. It is gratifying that these three utilities are stronger than ever before. And others that have not been caught by the tentacles of public power also report gains.

Kilowatthours consumed by customers of several Northwest companies stand at an all-time high. Engineers predict that by 1964 the Northwest will require 13.5 million kw in place of today's 5.5 million kw. This creates one of our two principal problems. Unless both are solved, private utilities in the Northwest could become extinct.

Northwest Problems . . . To an area that has primarily relied on hydro generation and must contrive to harness turbulent rivers, all involved in conflict of one kind or another, 13.5 million kw is hard to come by. There was a time when the government said: "Let the government provide generation for the whole area." But those bleak days proved that the government is not the answer.

As you know, we have public utility districts and must also bear up under a preference clause in the Bonneville Act. The act gives public bodies all the power they can consume. Private utilities are permitted only the surplus.

Entire output of federal plants will be consumed by public agencies within 15 years. Expenditures of your taxes and ours for federal dams will do us little good.

We are also confronted with license objections, fish and wildlife problems, legislation in many forms, water storage with its benefits, and much else. In fact, some 75 individual situations must be resolved before many projects now under consideration can be consumated.

Partnership Solution . . . We believe we have found the solution. The partnership policy of the present administration in the field of electric power actively encourages the development of natural resources. It differs from the New Deal and Fair Deal power policy which advocated the nationalization of electric power.

The federal government should never assume responsibility for the power requirements of any area. Private utilities individually and jointly must explore every possibility to meet growing needs. Our situation demands that we proceed in a vigorous and progressive manner.

The partnership plan can be a real stimulus to prosperity and is not a policy of monopoly. Instead it includes the states and local communities, private citizens, and the federal government, all working together. Never before has there existed the serious effort which we see today.

How Partnership Works . . . Examples of the partnership principle at work are not difficult to find. A bill introduced in Congress in March would authorize the John Day dam on the Columbia River, costing some $310 million. Though the U. S. Government would retain title and Army Engineers do the construction, it is proposed that three private power companies and others caring to participate will advance $273 million.

We believe the bill offers a sensible, definite, and practical way to get projects started without loss of time. Huge amounts of money can be saved the taxpayer.

All in all, private utilities in the Northwest either are building or they are giving consideration to some 45 new hydroelectric projects. We contemplate about 3.7 million kw of new power in the next few years.

Private Enterprise Threatened . . . However, all is not rosy. Small political blocs and others have proved that they would prefer to have no power than have it developed by private enterprise. Their objective is to destroy private enterprise. Nationalizing power is step number one.

Several areas indicate that the public has less confidence in political power than existed in days gone by. A PUD has been voted out of existence, and other PUD members have signed petitions to vote for private utility service. An attempt to legislate a state PUD in Idaho failed.

Further evidence of disfavor is that numerous communities have felt the tax loss and bitterly complain that things once promised have not been realized. In recent elections in the Northwest the power issue was far less important than schools, taxes, and the like.

Tell Public About Socialism . . . I am inclined to predict that the road ahead will be increasingly difficult unless we tell the public about socialism. Yet few in the industry are willing to call a spade a spade and face our customers in assembly, on radio or television. We believe in the principle of expression, but are reluctant to apply it.

We can expect the political power bloc to increase its propaganda, and to hurry its drive to socialize the electric industry. Evidently, people in America have not yet learned the truth about socialism. We have the responsibility to inform them.

Adequate Wiring: Where Is It Going?

EW survey indicates it's the industry's wayward bus; everyone's aboard it, but few know how far to go

E. BRYSON SESSIONS, Assistant Editor, Electrical World

Adequate wiring—or the lack of it—is probably the hottest thing in the industry today.

It stands between the customer and electric living. It stands between the utility and bigger electric loads. From convention halls and sales conferences comes the repeated urging: "Break the AW 'bottleneck.'"

This is a report of how it's being done. Here are findings of a survey the editors of Electrical World have made among 76 of the nation's largest utilities. Together, these utilities serve 27,816,818 residential and rural customers—62.1% of the total 44,778,000 in the nation.

But the story of corrective action told here is 20 years too late in coming. About that long ago, the industry began exhorting people to live electrically. After the war the message took hold—in a big way. Americans were ready for electric living, but their wiring wasn't. As a result, inadequate wiring looms today as the greatest single deterrent to load building.

Just how bad is it? Here's one sign: According to our survey, 20 million residential and rural customers in the U. S.—a solid 42.7% of the nation's total—still have old fashioned, two-wire services.

How did inadequate wiring get to be the 'bottleneck" it is? Harry Restofski, vice president of West Penn Power Co and chairman of Edison Electric Institute's new Adequate Wiring Committee has five good answers:

1. The number of electrical services in the home has zoomed from 19 in 1930 to 54 today.

2. As the number of services grew, so did the use of electricity—from 629 kwhr in 1934 to 2,549 kwhr today.

3. Fifty per cent of our dwellings are more than 30 years old, and 67% are more than 20 years old. Certainly they're not wired properly to handle today's appliances.

4. The biggest markets lie with appliances that need 240-v circuits and bigger service entrances than 30 amp. That 42.7% of customers still have two-wire service shows how the growth of this market is stunted.

5. People don't understand wiring.

These then are the problems. On the next seven pages you are given a look at the promotional methods by which utilities attempt to solve them.

What the Survey Shows:

- Forty-three percent of residential and rural customers still have two-wire service . . . . . page 107
- In terms of money AW is getting an increasingly larger portion of the utility's ad budget . . . . . page 108
- But in few instances is the utility putting on the added people needed to sell it . . . . . page 109
- They use all types of promotional vehicles . . . newspapers and booklets are said to be best . . . . . page 110
- Finance plans are gaining popularity, but few yet show specific results . . . . . page 112

Who the Survey Covered:

Seventy-six of the largest electric utilities serving 27,816,818 residential and rural customers . . . 62.1% of the total.

And as an Added Feature:

National Adequate Wiring Bureau's Chairman C. C. Walker gives his answers to "How Well Is AW Paying Off?" . . . page 114

MONEY: Adequate Wiring Is Getting More . . . and a Bigger Chunk of the Ad Budget

Utilities seem to feel, fortunately, that adequate wiring has got to be a "put up or shut up" proposition. Big talk is being matched with money.

Sizeable jumps in AW expenditures are shown throughout the utilities surveyed. Some said they would spend as much as ten to even 68 times more this year than last. Examples: One large eastern company is going from $2,500 in 1954 to $170,000 this year; another from $15,000 to $100,000. Commonwealth Edison Co with its $1-million program and Philadelphia Electric Co's $252,000 "100-A" campaign by now are well-known to the industry. Expenditures by medium-size and small utilities are running anywhere from $15,000 to $70,000 this year, as compared to nothing to $30,000 in 1954. All these figures include salaries.

Only one utility, Consolidated Edison Co of N. Y., Inc, is cutting its AW spending (from $364,500 in 1954 to $277,000 in 1955). However, much of its 1954 appropriation went into a full-color, sound film "The Magic Link" which is now completed and being used as the principal vehicle in its AW promotion. Four others will spend the same this year as last.

What It Amounts To

From a cumulative standpoint, here's how this rise in AW spending shapes up:

- Average number of dollars to be spent this year per utility is $69,710, compared to $41,641 last year. This is an increase of nearly 60%.
- Average expenditure per customer: 19.32¢ this year versus 11.69¢ last, a rise of 65%. (A few individual utilities were found to be spending as high as 76 to 83¢ per customer this year.)

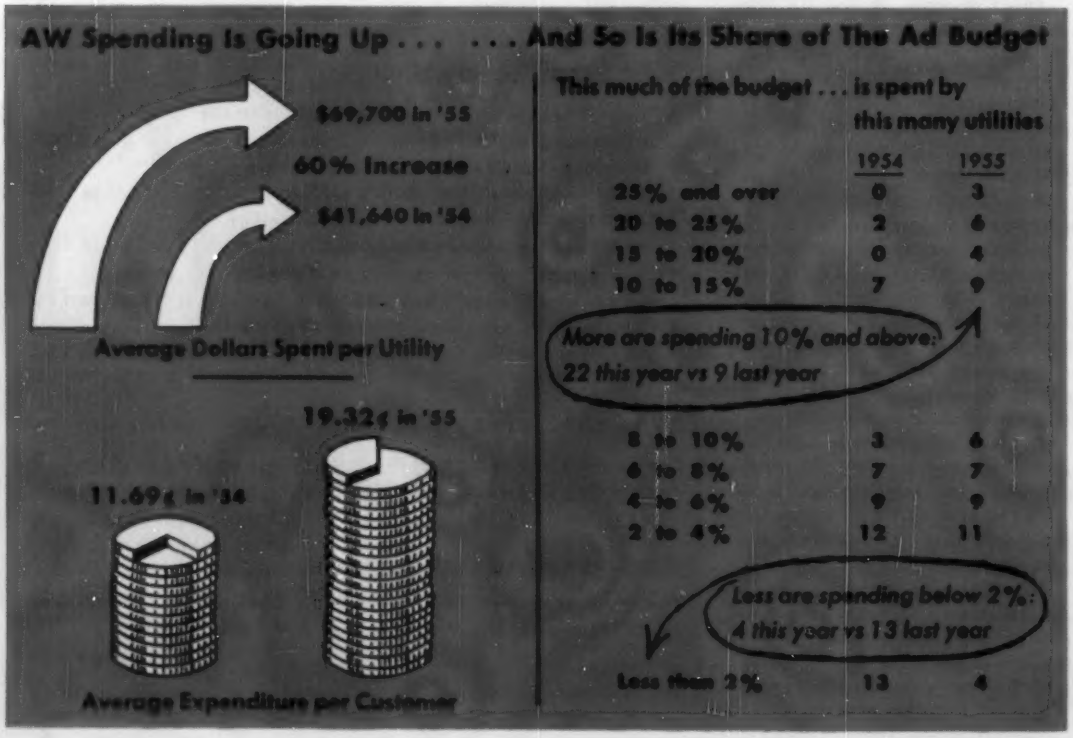
Unfortunately there were a number of utilities which could not report their expenditures—12 in 1954, and eight this year. Their reason: most didn't separate their AW money from their overall advertising and promotion budget.

As interest and spending goes up, adequate wiring is cutting a bigger and bigger piece out of the utility's advertising budget. Where last year its average, among the 76 utilities surveyed, was about 5%, this year it is up to 10%.

A large mid-western concern says it will devote one-third of its entire advertising bank roll to AW this year. Eight others are earmarking 20% or more. And where last year 13 utilities were turning over as little as 2% of their budgets to AW, only four will do so this year (see chart below).

Better Watchdogging

It also appears that there is a new effort being made to watch and control expenditures. For 1954, 22 utilities (29%) were unable to report the


AW Spending Is Going Up . . .
$69,700 in '55
60% Increase
$41,640 in '54
Average Dollars Spent per Utility
19.32¢ in '55
11.69¢ in '54
Average Expenditure per Customer
. . . And So Is Its Share of The Ad Budget
This much of the budget . . . is spent by this many utilities
1954 1955
25% and over 0 3
20 to 25% 2 6
15 to 20% 0 4
10 to 15% 7 9
More are spending 10% and above: 22 this year vs 9 last year
8 to 10% 3 6
6 to 8% 7 7
4 to 6% 9 9
2 to 4% 12 11
Less are spending below 2%: 4 this year vs 13 last year
Less than 2% 13 4

percentage of their budgets that went for AW. For 1955, this number had diminished to 17 or 22% of the total.

How are utilities breaking up these budgets between direct advertising (newspaper, television, radio, etc.) and straight promotion? It varies with each concern. Many split it 50-50, some 75-25 for one or the other, and a small number sink everything into just one. But putting them all together, advertising comes out with roughly a 2-to-1 preference. In 1954 they divided their AW appropriations, 62.3% for direct advertising and 37.7% for promotion. This year it remains pretty much the same; 65.9% and 34.1%.

Cutting Deeper

With AW getting more money and a larger piece of the budget, it is naturally cutting into funds that ordinarily would be put into selling ranges and dryers, and into similar load building pursuits. One utility executive justifies it this way: "We know we could be using a lot of this money for selling other things that'll immediately bring us more revenue. But if we don't get this headache taken care of, how can we keep selling more things into people's houses?"

MANPOWER: It Doesn't Match the Money Being Spent. There's Still Not Enough

Although more AW money is being appropriated, most of it must be going into advertising and promotion. Because one thing appears certain: Utilities are not using it to hire more people.

For the most part, staff attention to adequate wiring is still sandwiched in between other jobs—on a "work-it-in-when-you-can" basis. Almost every utility (90.8% of them) said they had employees who worked parttime on adequate wiring. The number ranged from one for a smaller concern to 150 for one of the largest. Several, instead of giving specific figures, said that their entire sales organization worked on it at one time or another.

The disturbing thing is the dearth of fulltime AW personnel. Only 34 or less than half of the utilities surveyed have them. Two of the largest utilities have as many as 12 to 14 men working directly on AW eight hours a day. The others have from one to eight.

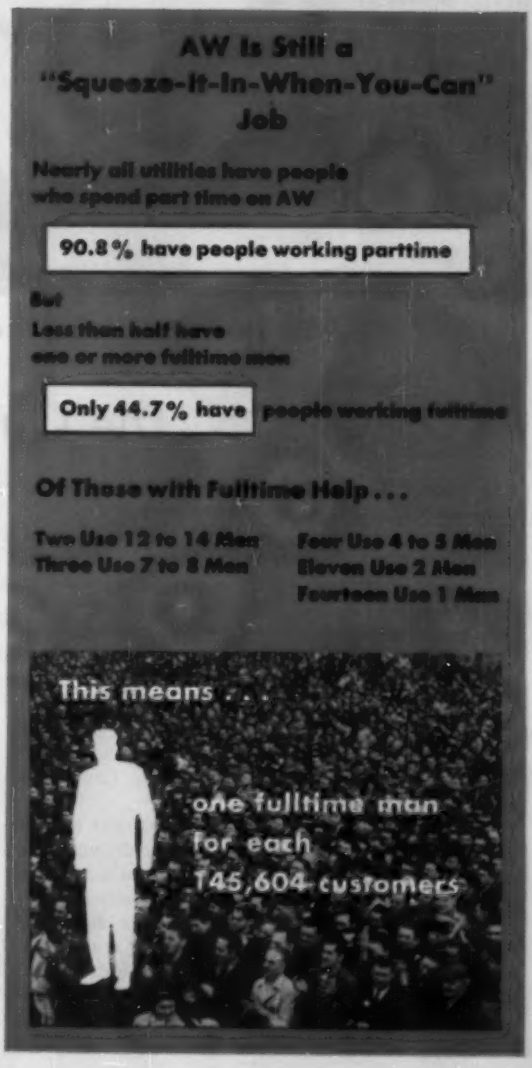
A Thin Spread

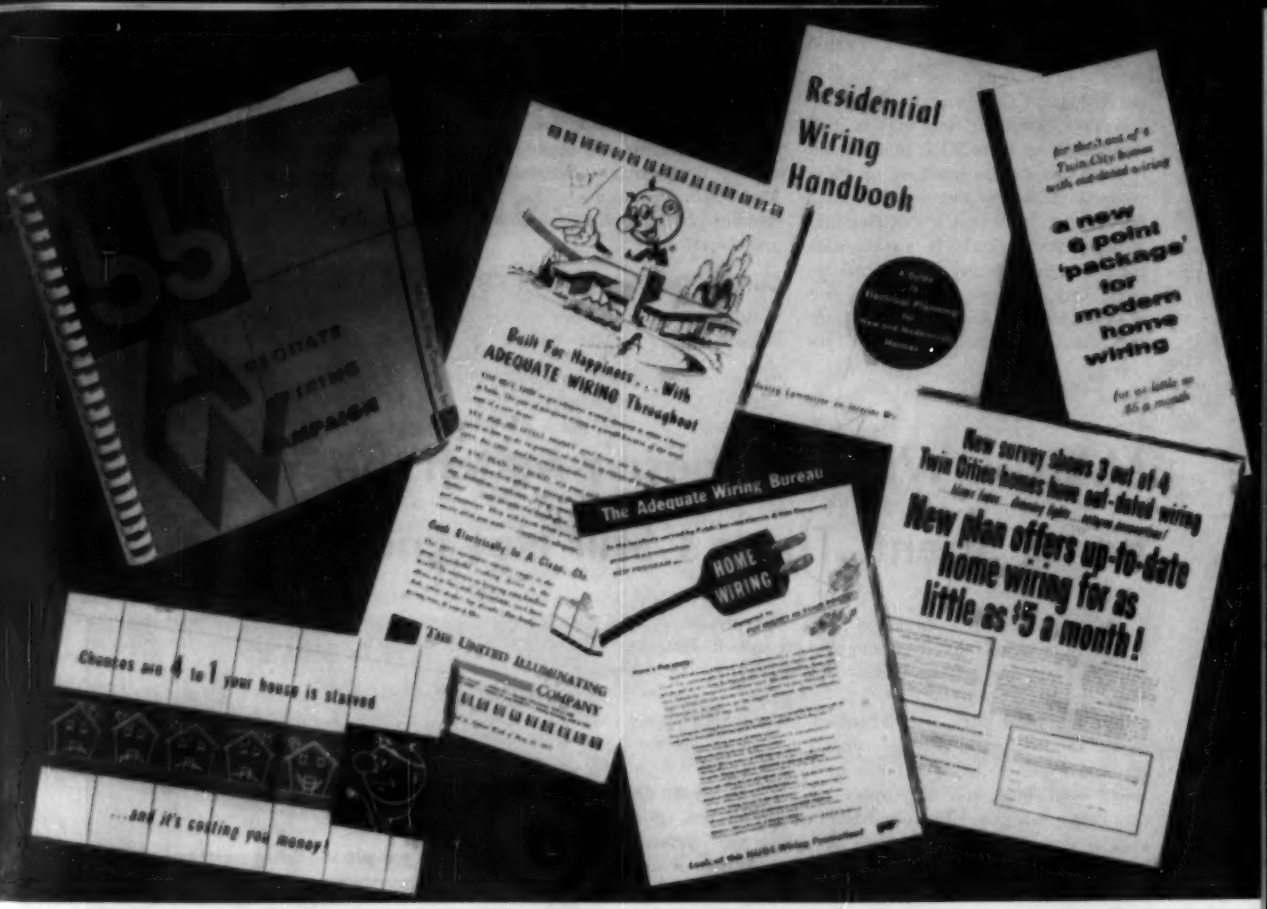
Even so, if all the fulltime manpower reported here was combined, it would total only 101 persons. This means an average of one full-time employee for every 145,604 customers these utilities serve; or putting it another way, an average of 1⅓ fulltimers per utility. And this still leaves no full-time man for the nearly 13 million more people served by 40 concerns who say they have no eight-hour-a-day help.

True, this is a bit of statistical manipulation, but it helps to show how thinly spread utility AW personnel is.

In practice, the three best staffed utilities have one person for every 22,000 to 28,000 customers. These fulltime promoters are, in most cases, experienced specialty wiring salesman. In some instances they are home service women. How well they produce is shown in Kansas City. There the addition of specialists has picked up a slow-moving wiring program and sent it sailing (page 112).

For the most part, those that have fulltime AW employees consider them essential to the success of their programs. As one sales executive put it: "To make it go, you've got to have at least one guy who knows adequate wiring is his baby. It takes someone who has AW on his desk from 9 till 5 o'clock; not piled in his 'In' basket under a stack of other things."


AW Is Still a "Squeeze-It-In-When-You-Can" Job
Nearly all utilities have people who spend part time on AW
90.8% have people working parttime
But
Less than half have one or more fulltime men
Only 44.7% have people working fulltime
Of Those with Fulltime Help . . .
Two Use 12 to 14 Men
Three Use 7 to 8 Men
Four Use 4 to 5 Men
Eleven Use 2 Men
Fourteen Use 1 Man
This means . . .
one fulltime man for each 145,604 customers


Residential Wiring Handbook
Built For Happiness . . . With ADEQUATE WIRING Throughout
a new 6 point 'package' for modern home wiring
New survey shows 3 out of 4 Twin Cities homes have out-dated wiring
New plan offers up-to-date home wiring for as little as $5 a month!
The Adequate Wiring Bureau
HOME WIRING
Chances are 4 to 1 your house is starved
...and it's costing you money!

With tons of literature like this, plus a wide variety of other media,

PROMOTION: The Question Remains, Does It

The ways utilities tell their customers about adequate wiring are as widespread as the problem itself.

But among the 76 utilities in this survey, it appears that booklets for handout to customers are most popular. Newspapers, direct mail pieces, radio and television follow in frequency, in that order (see table at right). Television trailed behind, most likely because it is more costly. In many cases the handout consumer booklets double as direct mail pieces.

Besides the major media noted above, 64½% of the utilities in the survey use a variety of supplementary promotional vehicles. Some 17 companies said they use films, six of them specifically mentioning Consolidated Edison's film, "The Magic Link."

Displays also were frequently listed, followed by home shows and model homes, carcards, billboards, magazines, and wiring demonstration boards for use in schools and at exhibits. Two concerns listed youth instruction.

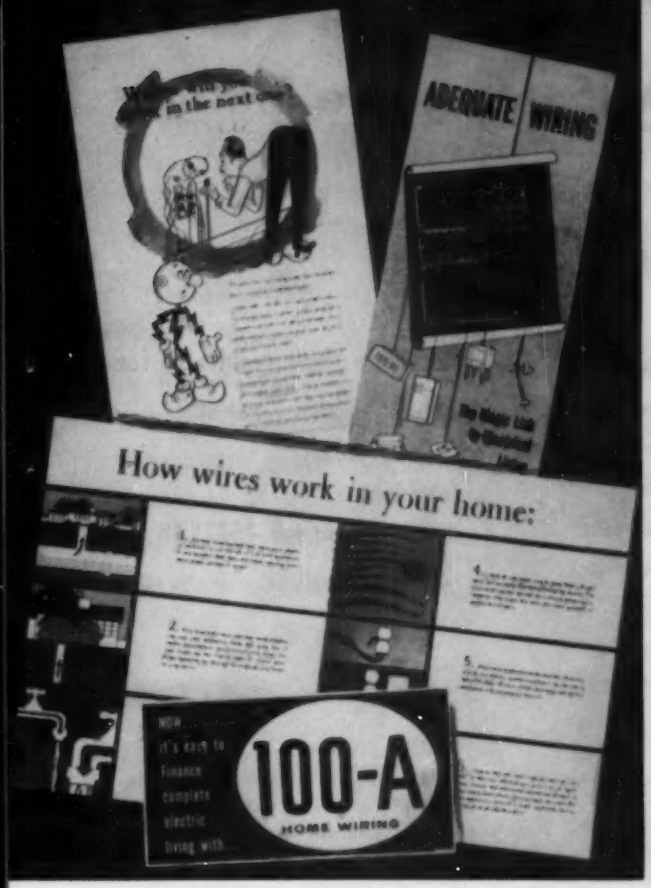
Still others mentioned use of postage meter slugs, newspaper article reprints, window streamers for branch office and dealer use, and AW group meetings in various localities. One said it stressed adequate wiring in a kitchen planning service it provides. Another offers special estimating sheets to its dealers and contractors on which is emblazoned the AW pitch. One even said it used illuminated house number holders as a promotional gimmick. Con Edison plugs its "Magic Link" film on letterheads.

Six utilities also listed personal contacts when asked what other means of promotion they used. Naturally, it's to be assumed that many more rely on this method, but did not regard it as a promotional medium in their replies.

Need Trade Help, Too

Most of the media and methods treated here are aimed at the direct consumer. But utilities are faced with selling contractors, dealers, home builders and architects as well. Most of them reach these trade allies through personal calls and meetings. Some outline each group's particular stake in the market in special brochures. A few (particularly those with wiring finance programs) wrap up stickers, banners, literature and other sales helps in a promotion kit which they give to dealers, contractors and distributors.

What media do utilities consider the most effective? The two most frequently used also were said to be best. Overwhelming favorite is newspapers. Nearly one third of the 76 reporting favored them (see chart at right). Runner up is consumer booklets, followed by direct mail, television and displays. Radio, while it has been used



utilities carry out . . .

Ring the Bell?

by 41 of the utilities failed to be mentioned even once as the most effective medium. Television received but six mentions although half of them have used it. One company liked its wiring board, and another its film.

Interesting is the fact that a sizable portion of those queried—13 or 17.1% of them—said frankly that they didn't know which medium is best. This could indicate they either don't believe that advertising can be measured, or else haven't taken the steps to find out. Two companies said that a combination of all of them was most effective. Five more, although they used it, rejected advertising, and insisted that personal contacts still worked best, evidently irrespective of the cost.

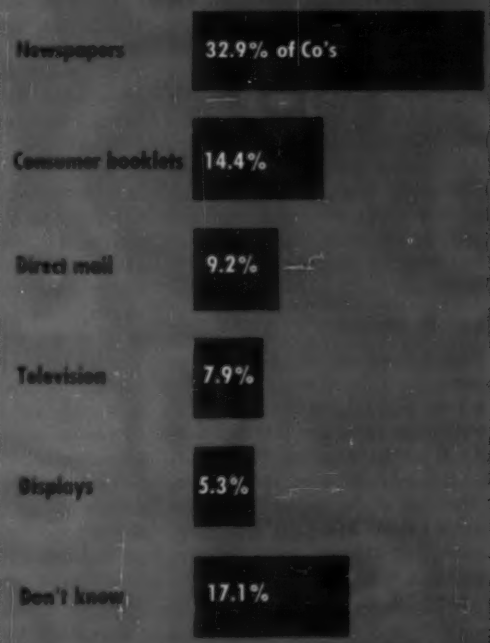
This has dealt with the means of selling adequate wiring, not with the approach. The question remains, is all this promotion hitting the customer's "hot button?" Some people in the industry maintain that wiring alone will not sell. You have to sell the appliances first, they say, before the consumer will feel the need for better wiring.

But by and large the trend seems to be towards selling AW on its own merits. Some utilities firmly believe they are on the right track and have proof they can point to. Still, more people than not continue to ask themselves: "Are we getting out of it what we should?"

Utilities Use These to Sell AW . . .

Consumer booklets	93.4%	(71 Co's)
Newspapers	86.8%	(66 Co's)
Direct mail	56.6%	(43 Co's)
Radio	53.9%	(41 Co's)
Television	50 %	(38 Co's)
Films	22.4%	(17 Co's)
Displays	14.5%	(11 Co's)
Home shows and Model homes	7.9%	(6 Co's)
Car cards	6.6%	(5 Co's)
Billboards	5.3%	(4 Co's)
Magazines	5.3%	(4 Co's)
Wiring boards	3.9%	(3 Co's)
Youth instruction	2.6%	(2 Co's)

And They Say These Work Best . . .



WIRE-ON-TIME-PLANS: More Are Starting

30 utilities (39.5%) of the 76 surveyed have wire-on-time plans

They finance them this way . . .

- 11 do it themselves
- 7 use banks alone
- 3 use banks plus themselves in combination
- 8 use banks plus other lending institutions
- 1 uses all three

These are their results so far . . .

Only 10 utilities could give specific results:*

Total jobs — 2,869

Avg value per job — $175.28

*As of time of questionnaire, March, 1955

Probably the most direct attack so far on the AW problem has been to help customers hurdle the cost of rewiring.

Nearly two years ago Cincinnati Gas & Electric Co set up its now famous wire-on-time plan. Today, 30 of the 76 utilities in the survey are actively promoting similar wiring finance programs in their areas. Nearly three-fourths of the 30 consider them successful.

But only 10 could show specific results. Of those that couldn't, seven said they were just getting their plans started at the time they were queried. The remainder claimed it was too early to know. Most had started their plans within the preceeding six months to a year.

What It Means

Here is what the 10 giving figures showed:

- Total jobs—2,869
- Average value per job—$175.28

As is to be expected, Cincinnati G&E has made the most wiring loans. At the time of the survey (February-March), CG&E had 1,110 jobs completed by 267 different contractors representing a total value of $272,000. By April 20, it had been upped to 1,270 jobs by 294 contractors totaling $313,081.

Cincinnati also had the highest average dollar value per job of any concern surveyed—$245. This high figure tends to pull up the average dollar value for all jobs in the survey. Actually the next highest utility ran about $174 with others ranging from $79 to $148.

Greatest number of utilities (11) handle the financing of their plans themselves. Eight use banks plus other lending agencies, seven use banks alone, and three, banks and themselves. One company, Philadelphia Electric, relys on all three.

Apart from immediate results, a number of utilities believe their plans will serve as a spring board for later buying. Declared G. W. Van Derzee, president of Wisconsin Electric Power Co: "While the number of wiring contracts so far received under our plan is not too substantial, we are keeping up the advertising because the general effect is good and it will form a background of thought for action by readers at some future time if not immediately."

Keep in mind that we are talking here only of utilities which either directly sponsor or actively cooperate in full-scale wire-on-time plans. A considerable number indicated they have rewiring financing available if the consumer asks for it, through regular bank loans, FHA, and similar means. But they are doing nothing to merchandise it. There are others, also, who limit their activities to subsidizing or financing installation costs of ranges, water heaters, dryers and air conditioning.

Dissatisfaction Breeds Success

Only two utilities with active wiring programs indicated any dissatisfaction. And one, Kansas City Power & Light Co, was quick to point out that its program is taking a turn for the better. Things started to look up when a retired contractor was hired to make house-to-house sales calls. He closed 26 of his first 27 calls at an average of $400 per sale. In a little over two months he had run up his score to 64 sales at an average of $356. He is paid by a group of local contractors who work with KCP&L and The Electric Association of Kansas City in promoting financed rewiring. The scheme has worked so well that they have since put on four more men.

Said J. M. Stafford, KCP&L's advertising and publicity director: "We believe we are getting close to an answer on the wiring modernization program for homes, namely, the tried-and-true specialty selling technique. We anticipate trying out sales crews working in various neighborhoods under a supervisor capable of making estimates almost on-the-spot . . .

Them, But Few as Yet Show Results

This is what they think of them . . .

Nearly ¾ths (22 of the 30) say their plans are successful. Six utilities said they don't know yet. One is not happy, and another says its plan is doing better after a slow start

and

Of those who don't have wiring finance*, this is what they plan . . .

*46 of the 76 surveyed

In 1955

Eight say they will start one

Five say they might

After 1955

Two say they will start one

Thirteen say they might

Maybe Never

Twelve said specifically they wouldn't start a plan

Six more indicated they wouldn't

We're stubborn in the belief that a wiring program can be made to work. . . ."

Pacific Gas & Electric Co, however, said frankly that its results have been meager. It put the blame chiefly on dealers' failure to use wiring financing as a sales tool. It intends to keep plugging, though, with hopes that it can strengthen weak contractor and dealer follow-up.

How They Work

With a few embellishments here and there, most of the wiring finance plans follow one basic pattern:

- They apply to residential and rural customers only;
- Customer must own his home, or agreement is made with landlord if customer rents;
- Wiring improvements are limited between utility's service entrance and customer's appliance outlets. (This can vary. Some will go beyond the service entrance, others will include lighting fixtures, plumbing for water heaters, etc.);
- Customer selects his own contractor and gets an estimate;
- Utility (or lending agency) checks customer's credit, gives contractor the go-ahead;
- After job is completed and checked, contractor is paid and payments are made with customer's electric bill. The utility, in effect, acts as a collection agency.

Amount financed, down payment and monthly installments vary. A job may run to $500 or more, and as low as $20 to $30. Some require nothing down, others 10%. Installments may extend 12 to 36 months.

What does the future hold for wire-finance plans?

There is a possibility that as many as 13 more utilities of the 46 in this survey without them, will have one going before the year is out. Eight said they will start one in 1955, and five said they might. After this year, two said they would, and 13 said they might.

Eighteen reacted negatively to the entire finance plan idea, with 12 of them saying definitely no—not now or anytime. Several of the "no's" expressed the feeling that local banks are adequately handling any financing requirements that may arise, and that no participation by the utility is necessary.

Look What PGE's Plan Did to Power Use

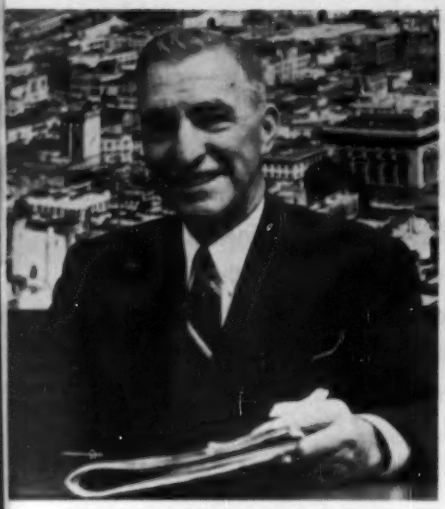
What happens when the inadequate wiring "bottleneck" is broken?

Portland General Electric Co found out. After a year with a financed wiring plan it checked up on power use of 401 customers who had modernized their wiring. Findings: Kwhr consumption had jumped exactly 100% per customer.

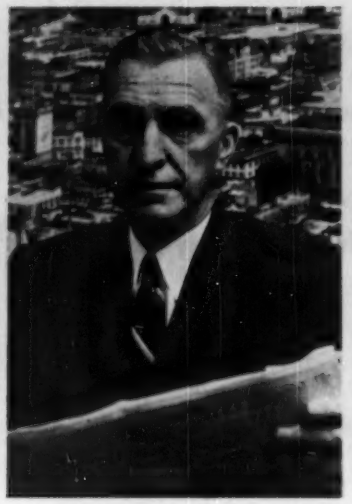
For one month ending January, 1954, the average use per customer was 487 kwhr. In January, 1955, it had exactly doubled to 974 kwhr.

Electrical World asks C. C. Walker, chairman of the National Adequate Wiring Bureau . . .

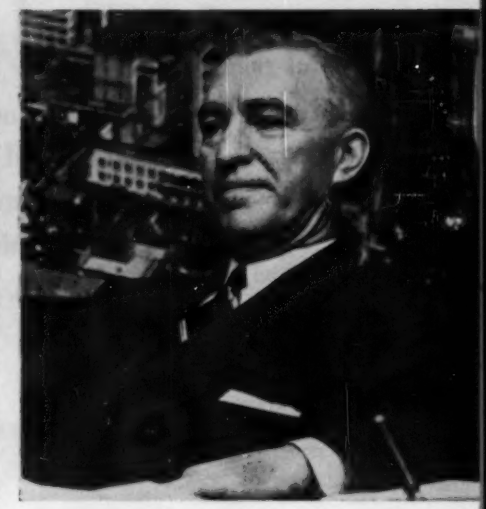
How Well is AW Paying Off?



"There's a new high in activity and interest . . ."



"Everything we told ourselves is happening now . . ."



"Support for NAWB is continued and growing . . ."

[Mr Walker, recently appointed commercial vice president for General Electric Co at San Francisco, has been chairman of the National Adequate Wiring Bureau since last February—The Editor]

Q: In a word, what progress is adequate wiring making, Mr Walker?
A: Judging from reports we receive at NAWB, there is a new high in activity and interest on both national and local levels.

Q: What leads you to think so?
A: Typical of things happening are the organized campaigns started at the local level by utilities with other branches of the industry and lending agencies. For example, take programs directed to the market for modernization of existing homes. Places like Chicago, Philadelphia, St. Louis, Newark, New Haven, Bridgeport, Minneapolis, St. Paul, Amarillo, and Spokane are cases in point. Individual contractors and distributors, too, are showing increased activity.

And, in the relatively few months since the revised Residential Wiring Handbook was issued, the bureau has licensed as many local electrical industry groups to certify adequate wiring in new homes as had been licensed in the preceding two years.

Q: What about nationally, Mr Walker?
A: It's the same on the national level. We have continued and growing support for the operations of the NAWB. We have a continuing national activity conducted by the National Electrical Contractors Association.

Two other recent developments along these lines are especially pertinent: First, the National Association of Electrical Distributors recently set up a committee to assist the National Adequate Wiring Bureau in its activities as well as to direct the NAED's own adequate wiring program. Second, Edison Electric Institute has just appointed a committee to come up with recommendations for a program which EEI can undertake. These represent progress on the national level.

Q: What do you think has caused this great increase in industry interest in adequate wiring?
A: We could talk of increased demand for all kinds of electric equipment which is running at a record high, and of utility and manufacturers' capability to satisfy that demand. We could talk about air conditioning and house heating. But, I think we can summarize it by just stating that everything we have told ourselves over the years would happen if we didn't lick the inadequate wiring program is happening right now. At the same time that our industry has awakened, the consumer, too, has awakened. He wants to live better electrically, and he realizes that he can do so—provided he gets the necessary wiring to achieve his goal.

Q: What should be the approach to the consumer in selling adequate wiring? Many times it's said that adequate wiring has no commercial appeal by itself, but has to be sold as part of the overall public desire for appliances and electrical living. What's your thinking on this?

(*Continued on page* 256)

ADVANCED PLANNING for Hartford Electric Light Company's new Middletown, Connecticut, unit included this scale model surveyed here by (*l to r*) G-E's F. C. Roberts, Hartford's J. C. Sonntag, K. L. Partridge, G-E's A. P. Wylie, Hartford's S. Kusmik, D. C. Switzer, and H. T. Barrows.

Latest Hartford Electric Light expansion adds 66,000 kw to interconnected system at Middletown

Latest chapter in the far-sighted expansion program of The Hartford Electric Light Co. is the 66,000 kw Middletown station. Designed to serve residential and industrial load which has blossomed since World War II, this unit will help Hartford and its interconnected system companion, the Connecticut Power Company, meet the electrical needs of more than 100,000 people.

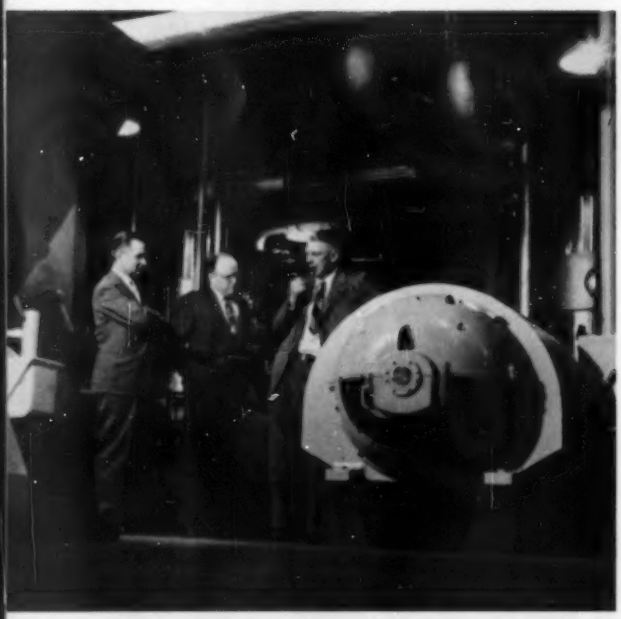
When the Hartford utility and its consultants, Stone & Webster, selected General Electric apparatus, their decision brought with it the advantages of G-E engineering teamwork. From preliminary design stages through final start-up, the G-E team assigned to the Middletown project gave vital assistance in keeping costs down and in meeting construction schedules.

GENERAL ELECTRIC

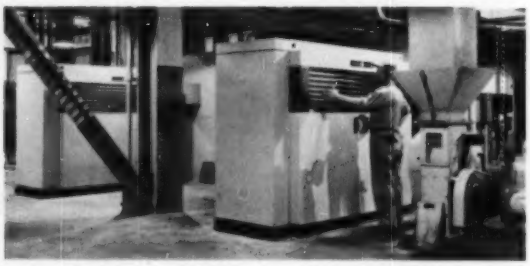
For More Data See Next Page ▶

PROJECT SERVICES REPORT:

G-E engineers integrate electrical equipment

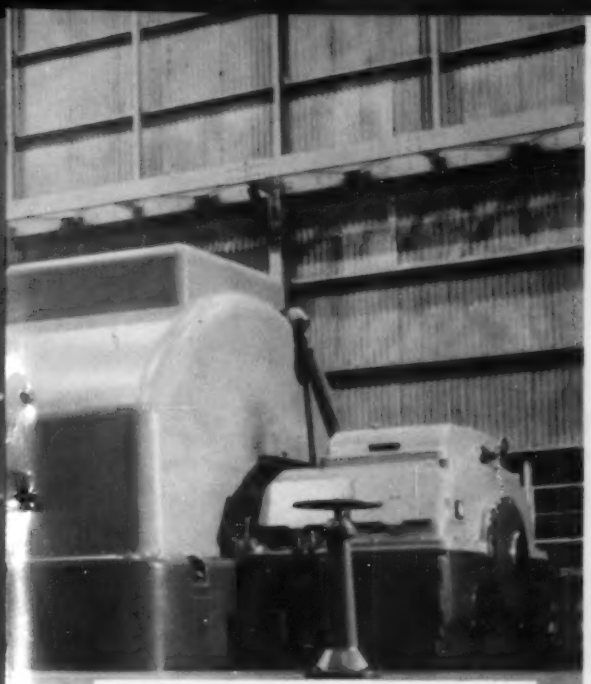


PROPER SELECTION of G-E motors, such as one viewed here by J. C. Sonntag, G-E's F. C. Roberts, Hartford's S. Kusmik, assured Hartford of better continuity of operation.



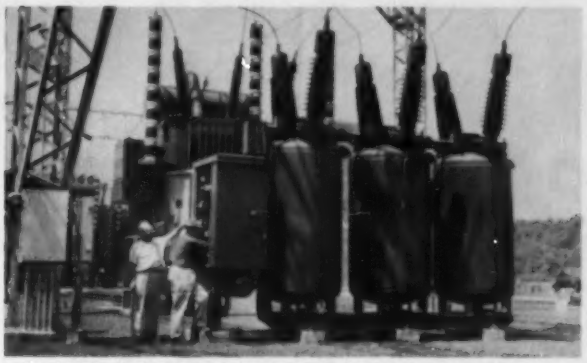
G. E. TRAINS OPERATORS to assure best use of equipment. Here a HELCO operator becomes familiar with 750 kva, 2400/480 volt load center unit substations.

STATION PLANS GET APPROVAL of D. Douglas (*l*), Power Production Consultant, Hartford Vice President C. L. Derrick (*r*), as Roberts and Wylie look on.



START-UP of 66,000 kw G-E turbine-generator, viewed here by The Hartford Electric Light Company's C. J. Sonntag and H. T. Barrows, highlighted the Middletown project.

THOROUGH PLANNING simplified later work. Above: S&W's L. O. Waite, G-E's L. E. Crane, S&W's H. N. McCampbell, G-E's J. Horvath, Jr., S&W's T. A. Fearnside.



SUPERVISED INSTALLATION of 115 kv G-E circuit breaker was one of many G-E Project Services.

designs to help HELCO boost system capacity

Unit responsibility for correlation of apparatus helps utility and Stone & Webster conserve engineering time

To aid in implementing the early planning on Hartford Electric Light's Middletown, Connecticut, station, a team of General Electric engineers was assigned to the job. Their task: integrate equipment design, manufacture and delivery, help keep installation on schedule. As a result, both the Hartford utility and its consultant, Stone & Webster, were able to conserve valuable engineering time and expense.

During the station's progress, for example, the G-E Project Engineer assumed the responsibility for coordinating changes in associated electric apparatus necessitated by revisions in major equipment. His work thus freed Stone & Webster and Hartford engineers of many details, enabled them to concentrate on the project's more important phases. And for Hartford, this unit responsibility resulted in maximum flexibility and station efficiency.

Similar teamwork, combining the utility, its consulting engineer and the G-E team of sales engineers, product specialists, application engineers, order service coordinators and field service engineers can also save you time, money and man-hours. Here's what G-E Project Services can do:

Simplify ordering of equipment, purchased either directly, or through your consulting engineers, or through a machinery manufacturer.

Conserve engineering time by handling electrical details which frees you and your consulting engineers for other urgent problems.

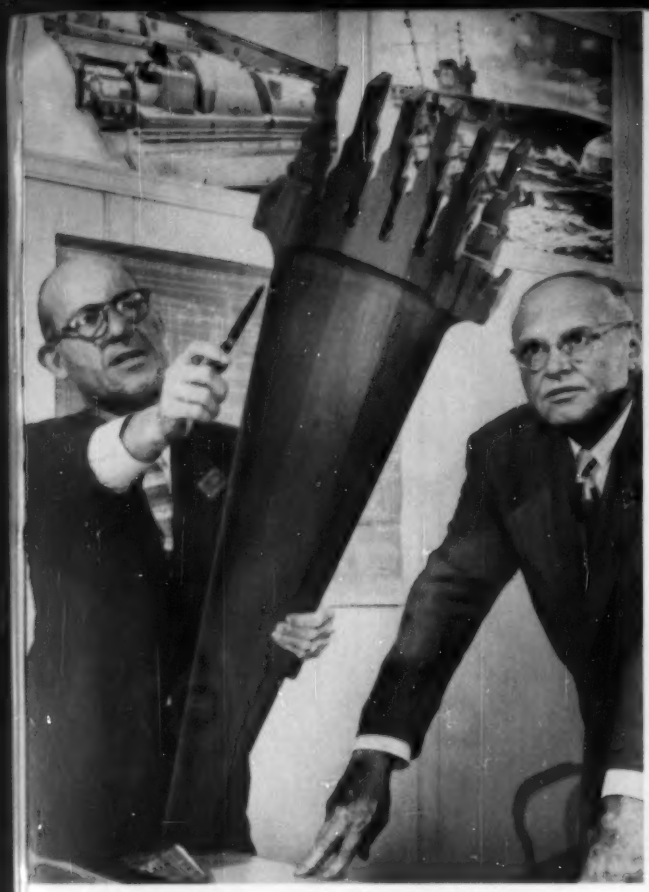
Integrate equipment design to assure the maximum flexibility and effectiveness of plant operation.

Speed construction by scheduling the arrival of equipment for minimum installation time.

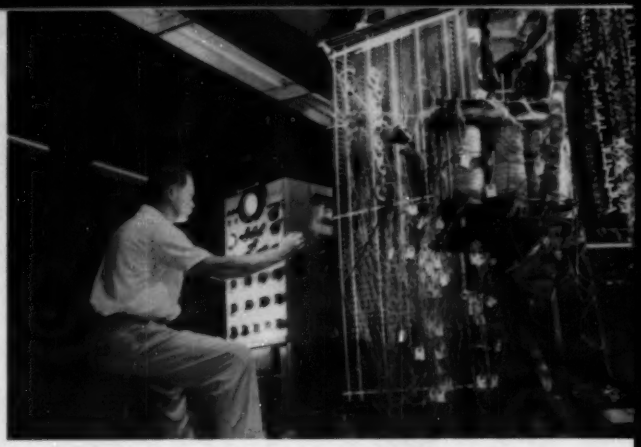
Assist in installation and in training operators to assure minimum start-up time and better understanding of the full operating capabilities of the equipment. For details contact your G-E Apparatus Sales Representative, or write to Section 302-9, General Electric Company, Schenectady 5, N. Y.

More Power to America

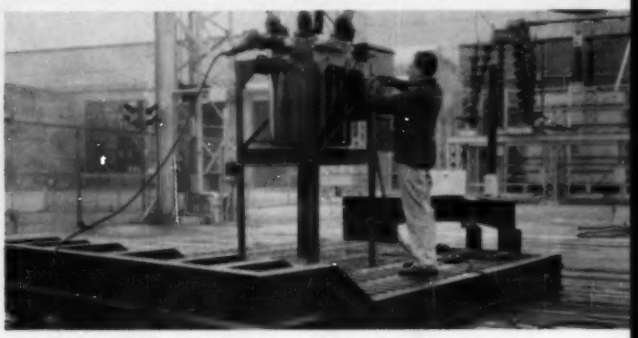
GENERAL ELECTRIC



NEW LONGER TURBINE BUCKETS promise higher turbine ratings, discussed here by C. W. Elston and L. H. Auchmoody, of G-E Large Steam Turbine-Generator Dept.



NEW TRANSFORMER DESIGNS, lighter and smaller, having improved thermal and electrical characteristics, are resulting from electromagnetic model testing.



NEW DISTRIBUTION BREAKERS, with faster interruption to minimize chance of line burn-down, are exemplified by this new production 5-cycle distribution breaker—from G-E's Switchgear Development Laboratory.

G-E product development assures electric utilities of improved system apparatus to meet future loads

As demands for electricity continue to soar, the advantages of General Electric product development become increasingly clear. From a vast network of G-E laboratories outstanding engineering advances have come to improve product operating reliability, extend product life. With these as the foundation, utilities have been able to step up station efficiency and—more important—prepare their systems for tomorrow's loads.

Product Development is just one of the many important benefits gained on your job when you or your consultant specifies G-E equipment. You can take advantage of all these services with G.E.:

Application engineering helps assure that all the items of electrical equipment are coordinated in design and operation.

Product development means you get equipment that incorporates latest design features.

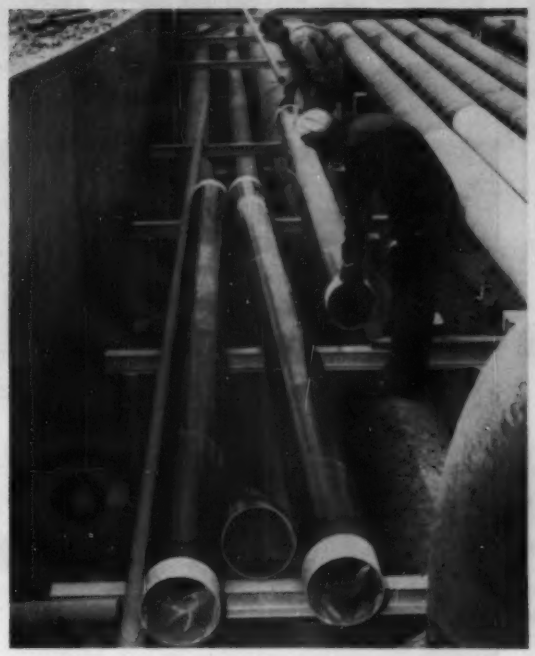
Field service engineering means supervised installation, planned start-up, proper operation of equipment.

Service engineering helps keep plant operating at full capability, means training of operators, setting up of maintenance programs.

Project coordination helps assure proper selection, design, manufacture, delivery of your equipment without costly delays at installation time.

More Power to America

GENERAL ELECTRIC



FIRST INSTALLATION of the plastic pipe was at the 512,000-kw Valley Steam Plant. About 5,000 ft of 10-in. ID was laid for water make-up lines to the cooling towers

FIELD JOINTS are made by roughing and then butting ends of the pipe. Ends are then wrapped with glass tape which is impregnated with polyester resin during wrapping

Plastic Pipe Reduces Cost Of Lines to Cooling Tower

A. F. FRENCH, Sr. Mechanical Engineer, Department of Water & Power, Los Angeles, Calif.

The first plastic pipes for cooling tower makeup lines have been installed at Dept of Water & Power's Valley Steam Plant. Studies show the installed cost of glass-reinforced polyester resin pipe is less than that of all-welded steel pipe. Evaluated for life expectancy, the plastic pipe has a cost very much less than that of either steel or rubber-lined steel pipe.

The original installation consisted of about 5,000 ft of 10-in. ID plastic pipe for cooling water makeup to the eight main cooling towers. About 2,000 ft of pipe in 4, 6 and 8-in. sizes was used for acid storage, area drainage, and bearing cooling water lines. Because this installation on the first two units of the plant was for experimental purposes, the pipe was placed partly in exposed outdoor areas, in buried locations, and in indoor areas.

Based on sufficient and satisfactory operating experience, the Department will use plastic pipe exclusively for cooling tower makeup and bearing cooling water systems for the second two units at Valley Steam Plant. Glass reinforced polyester resin in 4 to 12-in. sizes and polyvinyl chloride pipe for the smaller sizes will be used. Along with other types of plastic tubing, PVC also is being used extensively for instrument and control piping including 100-psig compressed air service.

Before the glass-reinforced pipe was accepted for use, the Department tested and analyzed samples to determine its physical and chemical properties. Some properties of the pipe published by the manufacturer and checked by the Department are given in an accompanying table.

(*Continued on page* 122)

Vital Statistics of Glass-Reinforced Polyester Resin Pipe

Physical Properties

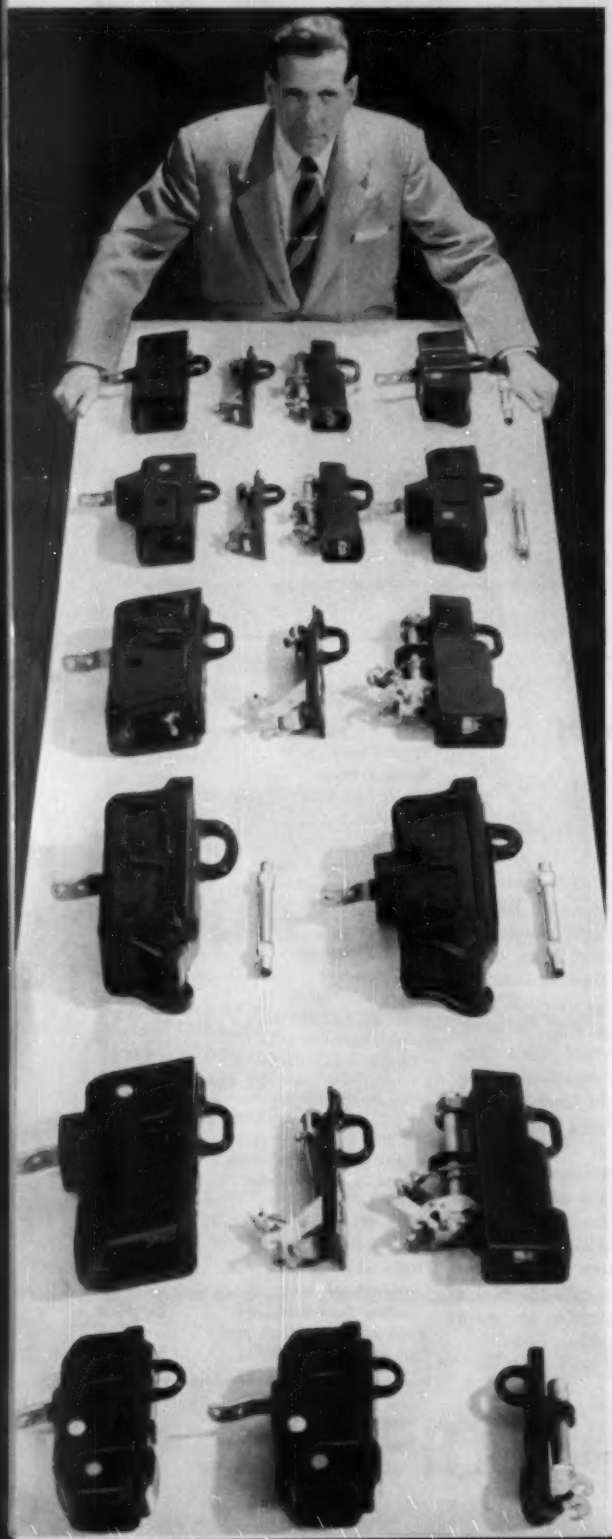
Tensile strength	14,000 psi
Burst strength	
4, 6, and 8 in.	1,000 psi
10 in.	800 psi
Working pressure	200 psi
Compressive strength	22,000 psi
Flexural strength	30,000 psi
Modulus of elasticity	5.0 x 105
Impact (Izod)	15 ft-lb/in. of Notch
Specific Gravity	1.40
Resin content	70% +5
Water absorption	
(24 hr. L P 406 A)	0.3%
Barcol hardness	40
Thermal conductivity, K	1.5 Btu hr/in./deg F

Chemical resistance

Salt water	Excellent
Aliphatic hydrocarbons	Excellent
Aromatic hydrocarbons	Excellent
Mineral oils	Excellent
Vegetable oils	Excellent
Chlorinated solvents	Poor
Dilute acids	Excellent
Concentrated acids	
(other than oxidizing)	Excellent
Weak alkalis (7.5 ph max.)	Fair
Concentrated alkalis	Poor

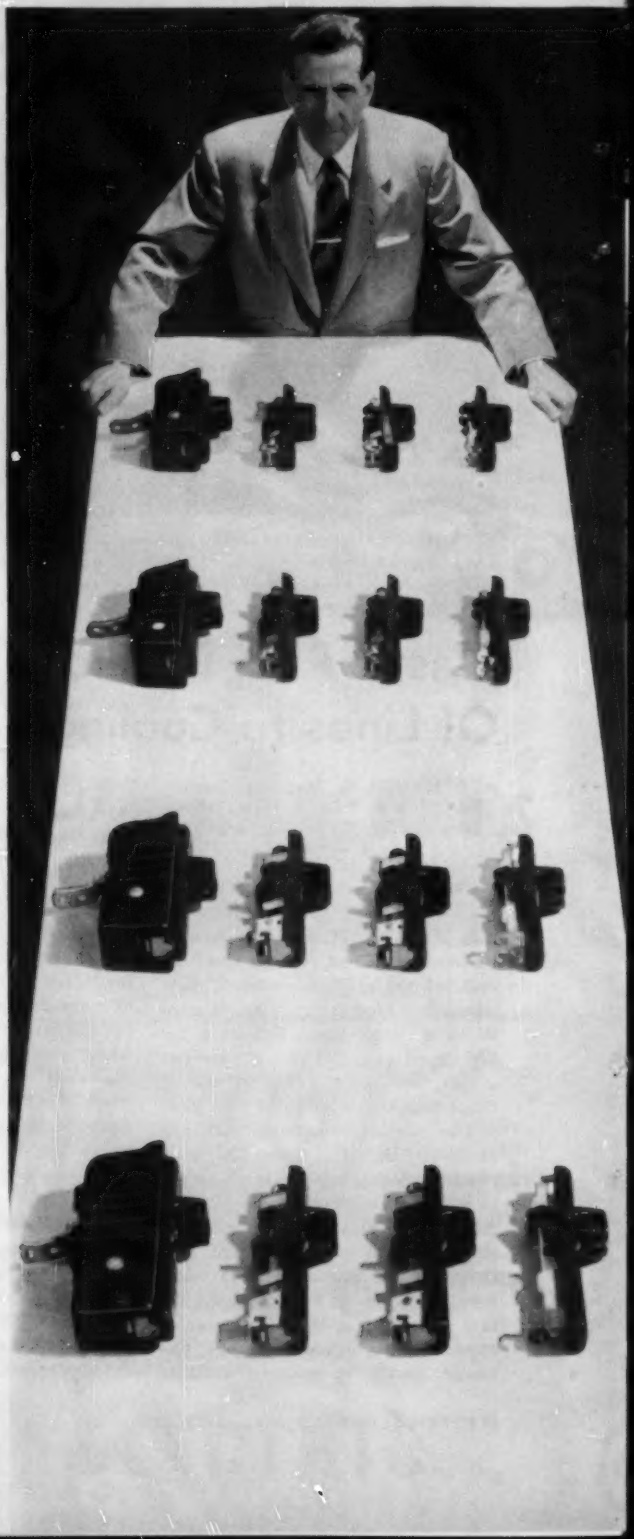
old

Stan Howard, Supervisor, Product Engineering, displays 10 housings and 15 doors of old cutout design.



new

In new design, Stan shows total reduction in housings and doors while interrupting ratings are increased.



ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Stocking is simplified, interrupting ratings increased in new G-E fuse cutout line

Not since 1935, when General Electric first introduced the "family" concept of interchangeable doors, has there been an enclosed fuse cutout development like this!

ALL THE FUNCTIONS—with fewer housings. Before, it took ten housings and fifteen doors to do the job. Now, in G.E.'s all-new line, *four housings and sixteen doors meet every standard cutout need!*

Think of what this means to you and your lineman: There's less chance of error. Stocking is simplified, too. Smaller inventories mean lower handling and storage costs—and lower installation costs. All the lineman has to do is change doors to uprate the cutout.

EVERYTHING YOUR SYSTEM NEEDS. G.E.'s new fuse cutout line gives you all functions—drop-out, non-dropout, indicating, disconnect—in one basic design. You get normal-duty, heavy-duty and/or extra-heavy-duty in all ratings, to match every possible system demand. For a complete description of the new cutout line, write for Bulletin GEA-6208, General Electric Company, Section 433-9, Schenectady 5, N. Y.

LINEMEN AND ENGINEERS AGREE

The completely new line of G-E fuse cutouts has more of the features they prefer. There's good reason, too—the new design incorporates suggestions made by utility engineers and linemen to G-E sales engineers and specialists.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Plastic Pipe for Cooling Tower Lines

(*Continued from page* 119)

Economic studies were made to determine the relative cost of all-welded steel pipe, rubber-lined and flanged-steel pipe and glass reinforced polyester resin pipe. These studies showed that the material cost of the plastic pipe is about 100% more than that of steel pipe but about 67% less than that of rubber-lined steel pipe.

However, the light weight of the pipe, 6.13 lb/ft for the 12 x 0.250-in. wall size, and ease of making joints contributes to a lower installed cost. Thus, the in-place cost of the plastic pipe is less than that of all-welded steel pipe. In addition, the plastic pipe is not subject to acid corrosion. Therefore, when evaluated for life expectancy, the plastic pipe costs very much less than either all-welded or rubber-lined steel pipe.

Coefficient of friction of the plastic pipe is about equal to that of glass pipe. Because it will not corrode or tuberculate, a coefficient of about 140 (William and Hazen) may be assumed for the life of the pipe. This lower value will reduce pumping costs or will allow use of a smaller pipe if the head is constant.

Strength of the pipe is proportional to a number of variables. These include size, wall thickness, percentage of glass fibre matt, grade of resin, manufacturing process, and operating temperature. Pipe strength as determined by these variables may be obtained from the manufacturer.

Several types of joints and fittings are available, including threaded and coupled, grooved and coupled, and butt wrapped. The latter type has been used exclusively by the Department. When this type of joint is made properly, its strength will exceed that of the pipe. Cost of this joint is considerably less than that of any other type of joint.

Combination kwhr-voltmeters replace conventional residential socket-type meters to . . .

Spot Incipient Voltage Troubles on Feeders

J. E. McNICOL, Senior Engineer, Kansas Gas & Electric Co, Wichita, Kan.

A new meter that combines a kwhr meter and a voltmeter in one instrument is being used by Kansas Gas & Electric Co to help locate undesirable voltage conditions. The meters are installed in place of socket-type kwhr meters at homes located at strategic points on the feeder. Meter readers check the voltage monthly while reading the kwhr meter.

The single-phase voltmeters, incorporated with standard kwhr meters, are of the 15-min thermal type. They have three hands, one indicating and two drag hands for maximum and minimum voltage indication.

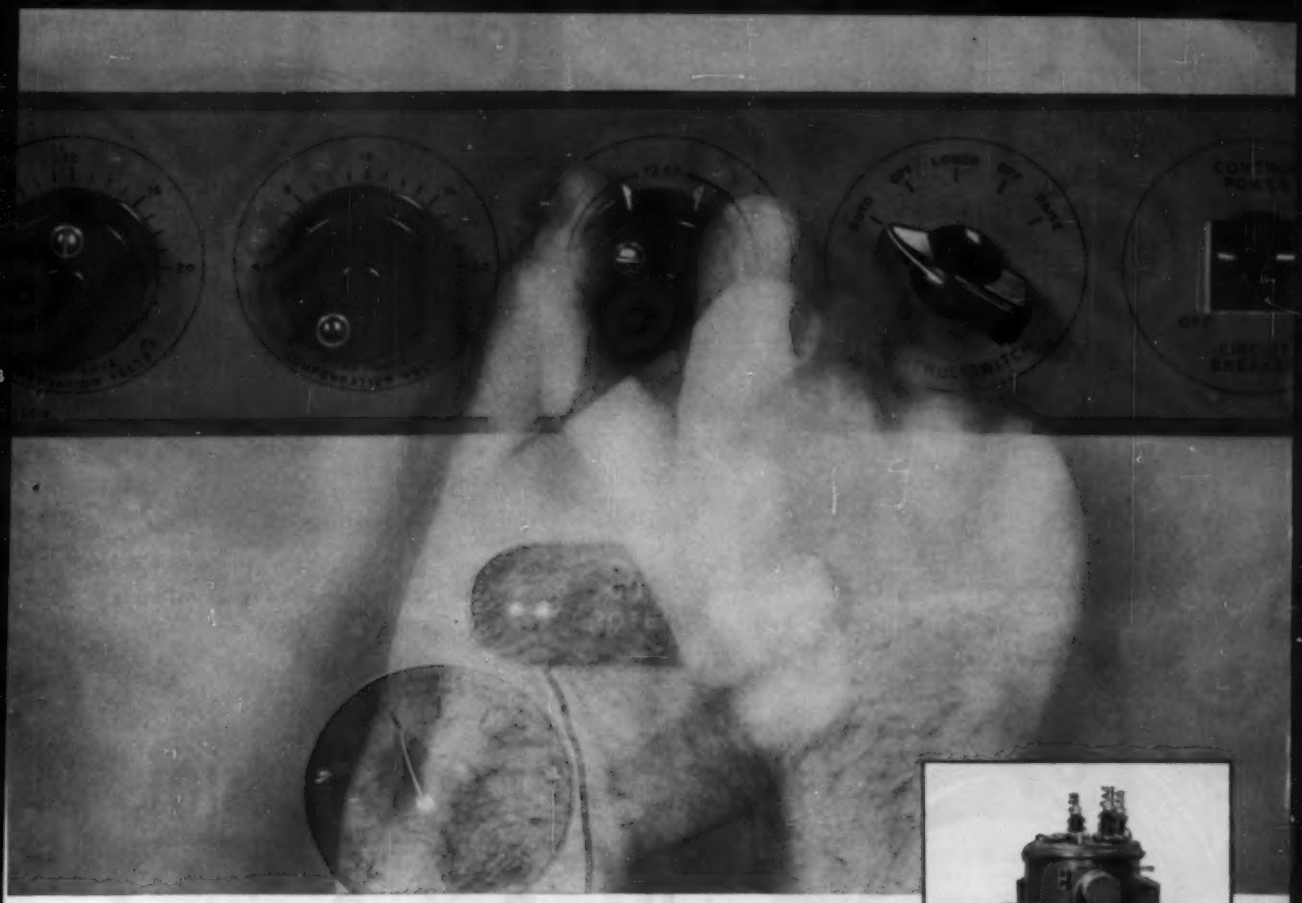
Installation of the combination kwhr-voltmeters is a result of the heat storm last year during which residential customers bought 9,000 window air conditioners. These air conditioners caused trouble on the distribution system, mostly with transformers and secondaries. Because there was no way of knowing where conditioners were being installed, field checks were made. But they were slow and time consuming.

New record loads are expected during this summer. So, steps have been taken to obtain up-to-date information about the primary system through the use of the new residential meter. In March 1955, 50 of the meters were installed at homes selected for their location on the primary system.

They were placed on houses that are supplied directly from distribution transformers. Generally, the transformers are near the ends of the primary circuits. In some cases, a second kwhr-voltmeter is installed near the first customer on a feeder.

Each month when the meter reader reads the customer's kwhr he also reads the voltages (max and min) shown on the drag hands of the volt-

(*Continued on page* 126)



DO YOUR STEP REGULATORS GIVE YOU

"Micro fine" relay testing for quick, accurate adjustments

It's *another* important General Electric voltage regulator feature to give you unexcelled regulating accuracy. The "micro fine" relay test rheostat is the fastest way yet of getting the right voltage you need to adjust the voltage regulating relay.

There's no juggling between the increments of step-to-step voltage output . . . no compromising with the exact setting. Just one twist . . . a little more or less series resistance . . . and you get a micrometer-accurate voltage adjustment on the relay. Or, compared to testing with externally wired-in equipment, you save about 15 minutes set-up time. All of G.E.'s step voltage regulators have this important "micro fine" adjustment feature.

12 more features in G.E.'s 1955 line of step feeder voltage regulators give you greater accuracy, longer life, superior service. They add up to the most advanced line of step regulators available today. General Electric Company, Schenectady 5, New York.

433-7

ONLY G-E STEPS HAVE ALL THESE FEATURES

Greater Accuracy

- Class 1 Control Accuracy
- Control Dial Locking
- Control Test Rheostat
- Rheostats for LDC Adjustments

Longer Life

- Opti-Life Tap Switching
- One-Piece Cover Band
- Super-Melaglyp Paint
- Nitrile Rubber Gaskets
- Electrostatic Shielding

Superior Service

- Flat Upper VRR Contacts
- Up to 120-Sec. Time Delay
- Handy Meter Shelf
- Internal By-Pass Protection

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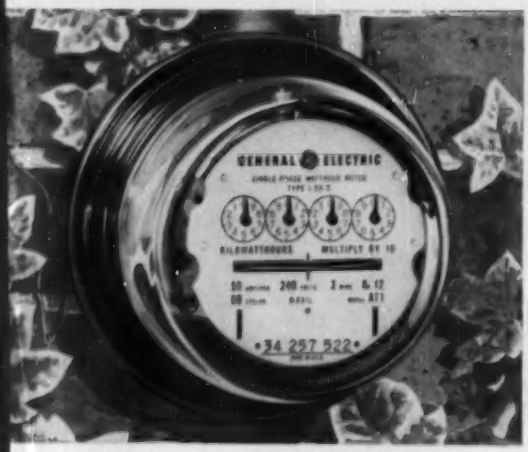
GENERAL ELECTRIC

For two-wire or three-wire metering

For 100-amp extended range metering

For 200-ampere installation



General Electric's Has Been Designed

For transformer-meter installation

For two-wire 120-volt application

For off-peak control

For demand measurement

Time-proven I-50 Meter Family to Lower Your Metering Costs

PROVEN BY MORE THAN 6,000,000 I-50 METERS IN SERVICE TODAY

With the development of the I-50 watthour meter in 1948, General Electric established a new trend in meter design which has become universally accepted throughout the industry. General Electric incorporated this revolutionary I-50 design in a complete line of meters—the I-50 meter family—designed to lower your metering costs.

The most recent addition to this quality line of meters is the extended range I-55 watthour meter. The new I-55 meter embraces the same cost-saving I-50 features—such as magnetic suspension, co-ordinated insulation, and unit construction—that have been proven by the more than 6,000,000 I-50 meters in service today.

These facts offer the greatest assurance possible that your investment in the I-50 meter family is an investment in the future.

For more information, contact your nearest G-E Apparatus Sales Representative and request further facts on the "Importance of Metering." Or write Section 621-3, General Electric, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Kwhr-Voltmeter

(*Continued from page* 122)

meter. He then resets the drag hands.

Voltmeter readings are recorded on a special sheet in the meter book located directly behind the customer's kwhr record sheet. This is all the field work that is required.

The voltage record is then used, along with other information, by the engineering department to determine what is happening to the various primary circuits. System planners can, therefore, determine in advance when voltage problems are developing on a feeder and start remedial action, without wasting money.

Hot-Stick Mounted Gun Greases Clamp, Reducing TVI

PETER N. TUGMAN, Pacific Power & Light Co, Portland, Ore.

GREASE GUN is mounted on two hot line sticks. Plastic spacers hold sticks parallel and prevent smearing grease

Clamps and connectors on energized lines are greased with a hot-stick mounted gun to combat pole-line television interference in fringe areas. Results of the greasing operation in one of Pacific Power & Light's service areas have been very good. Following current tests to determine the long-time effectiveness of greasing, the gun may become standard equipment in every district.

The grease gun is mounted on two hot sticks. One controls the amount of grease applied; the other has a mechanism for positioning the gun. Plastic spacers hold the two sticks in position and allow the control stick to be moved back and forth. The upper spacer acts as a shield below the gun to help prevent the grease from smearing on the sticks, crossarms, or the pole. The grease must be applied carefully to prevent the "flash-charging" of a greased-smeared pole or arm.

An early problem was the compounding of a conducting grease. Ordinary industrial grease mixed with sufficient graphite to become a good conductor was found satisfactory.

Special Washing Vat Cleans Meter Covers, Cuts Time 85%

W. M. MILLS, District Meter Dept, Appalachian Electric Power Co, Roanoke, Va.

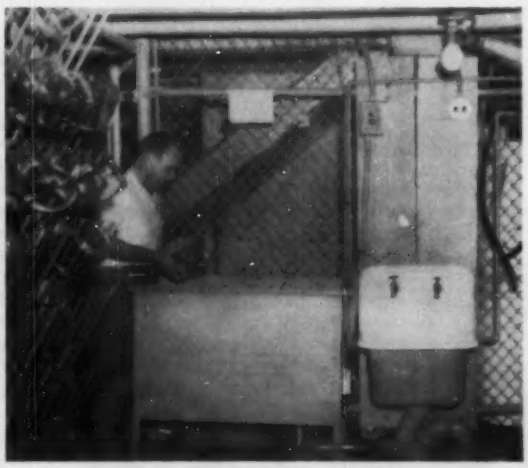
A special washing vat has reduced manhours required to clean glass meter covers by almost 85%. Fifty covers can be cleaned with less than one manhour of labor instead of 12 manhours previously required for 100 covers. Annual saving in a shop testing 50 or more meters a day may be $1,300 or more, including fixed charges and energy cost.

The galvanized iron vat, accommodating 50 covers, measures 2 x 3 x 1⅔ ft. It is braced and supported with 1-in. angle iron and has a drain trap with a valve on the bottom.

Inside of the grounded tank are an electric heater and solution agitator. The shielded heater, rated 2,500 w at 220 v, is supplied through a service protector and is thermostatically controlled for a solution temperature of 125F.

Solution agitator was formed from a ⅜-in. copper tubing with ⅛-in. holes at 4-in. intervals. It is connected through a valve to a compressed air line.

Meter covers are immersed in a solution containing 1½ cups of household detergent and hot water. They



are allowed to soak 24 hours at 125F, and then the solution is agitated for about 2 hours to remove dirt and loosen paint, so it can be removed with minimum effort. Covers are dried on a rack having wooden rods set at an angle.

(*More How To on page* 134)

The blade of the MK-40 switch is actuated by a 45-degree bearing mechanism which replaces cranks, levers, links and cams. It converts motion of operating insulator to a vertical lifting and rotating motion of the blade, with smooth sequence and complete control at all times.

Switch closed
Toggle effect of mechanism locks the blade in position. First 15° rotation of the insulator rotates the blade about its own axis, exerting enormous leverage force.

Switch partly open
Ingenious engineering principle effects blade rotation, with the blade rise in degrees exceeding insulator rotation in degrees.

Switch locked open
with the blade mechanism knuckle pin over dead center. Leverage force easily breaks ice accumulation or corrosion easily.

simplified, powerful blade mechanism

for smoother operation, longer service with MK-40 Air Switches

Only DELTA-STAR MK-40 Switches offer all these additional advantages

- Visible high pressure silver inlayed hard drawn copper contacts at both ends of switch blade. Independent pressure applying non-ferrous leaf springs assure constant pressure. Heavily constructed with a minimum number of current interchange surfaces to withstand high short circuit currents.
- These switches have the same simple basic design in all rated sizes: 7.5 kv to 380 kv. 400 to 5000 amperes.
- Greaseless non-rusting rotating insulator bearings.
- Fully adjustable operating mechanism parts with pipe piercing set screws to eliminate slippage.

This close look at the MK-40 blade mechanism demonstrates another reason why this DELTA-STAR Air Switch is your standard of comparison.

The MK-40 is the result of a search for engineering simplicity and maximum efficiency. Only three moving parts are employed. No cranks, levers, links or cams are used. Factory sealed mechanism contributes to easiest possible maintenance and long life.

The blade mechanism develops enormous leverage in initial opening and final closing. Ice accumulation or corrosion at either end is easily broken. Variation in leverage equalizes the gravitational pull on the blade and results in smooth uniform operational effort.

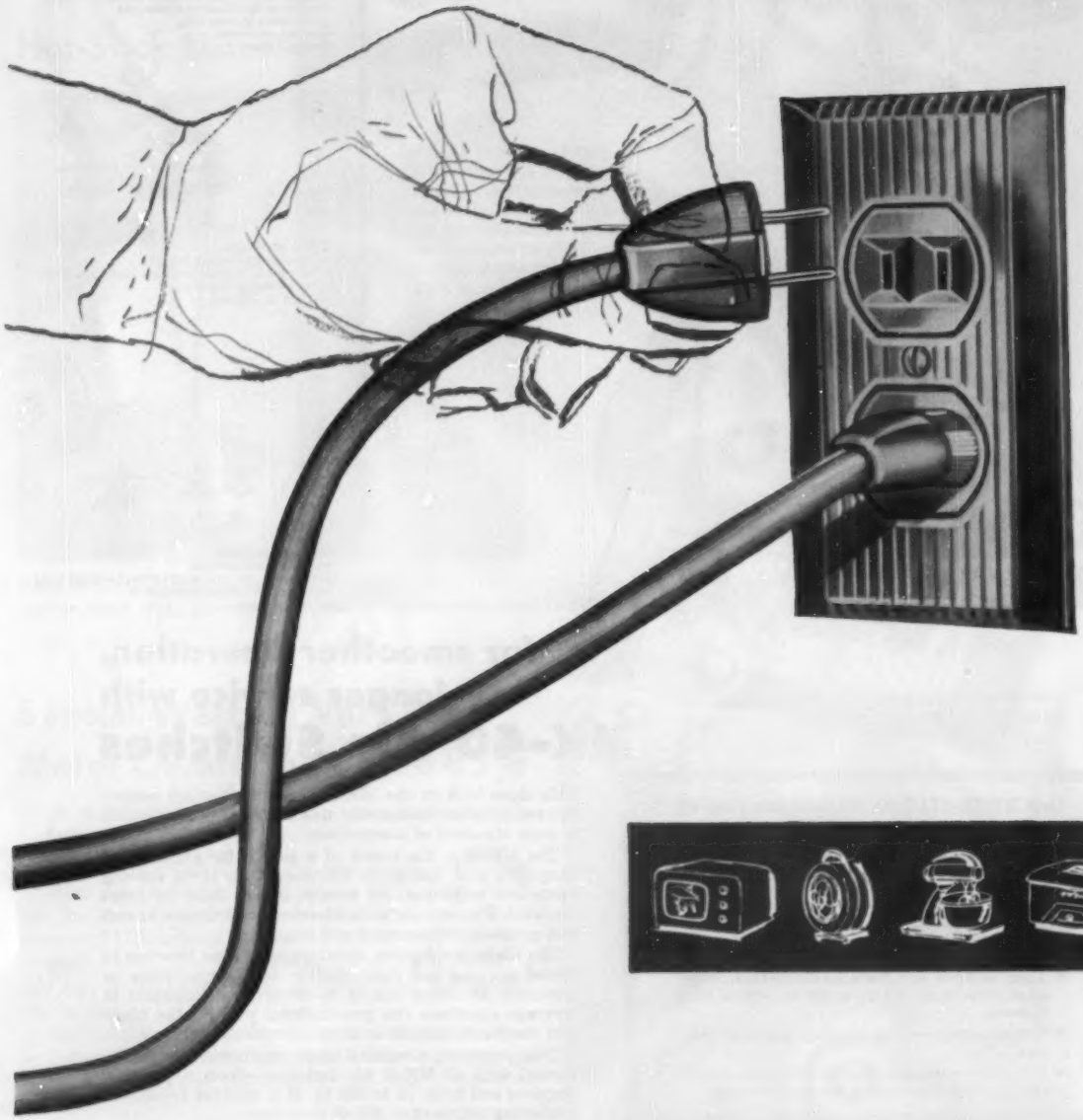
This powerful, simplified blade mechanism is fundamental with all MK-40 Air Switches—from 400 to 5000 amperes and from 7.5 to 380 kv. It is another reason for preferring DELTA-STAR MK-40 Switches.

When you want the best in high voltage switches specify the MK-40

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

a Current



M O L O N E Y E L E C T R

Power Transformers • Distribution Transformers • Step Voltage
Load Center Transformers • Unit Substations • Network Transformers

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT

Subject

What's said depends largely upon who's talking. However, utilities know basically what the subject will be . . . low voltage . . . low power factor . . . or both. Customers just don't care about your problems . . . or excuses . . . they only care about service. Just between us . . . they're right . . . and also just between us, you can accommodate them . . . by anticipation of the load . . . *and* by installation of the proper equipment. Don't overlook the importance of dependability in equipment . . . and don't forget that Moloney equipment means "dependability at it's best."

MEDS-10

I C COMPANY

Regulators • Regulating Transformers • Load Tap Changing Transformers
Constant Current Transformers • Capacitors • Transformers For Electronics

ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

MOLONEY ELECTRIC

A Guide to Grounding Substation Fences

An Adaptation from Distribution Standards of New England Electric System

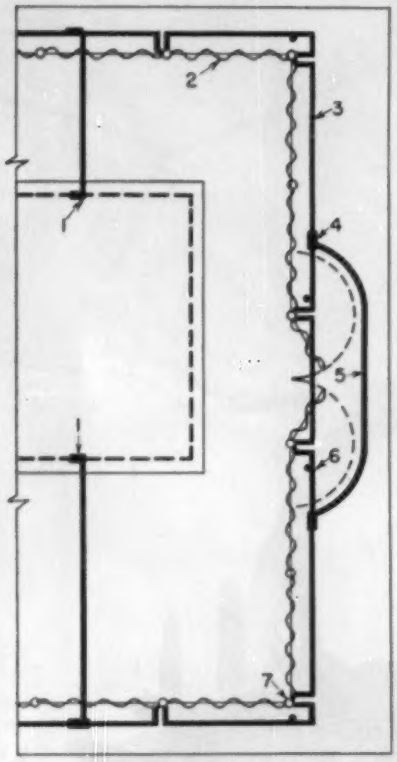


Fig 1 Typical Plan for Substation and Fence Grounding

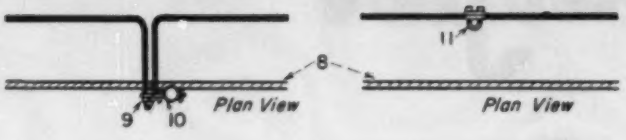


Fig 2 Post Grounding

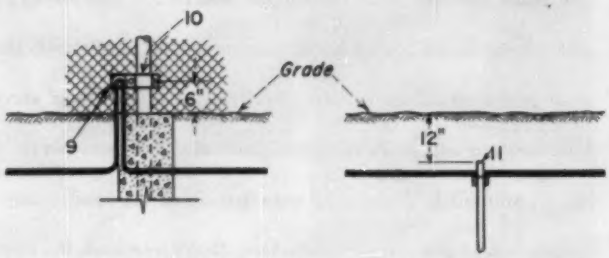


Fig 3 Ground Rod

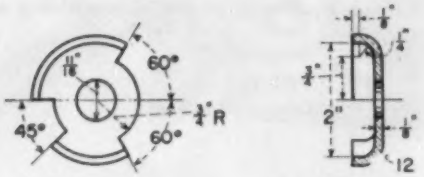


Fig 4 Grounding Cup Washer

ITEMS (as Shown in Figs. 1-4)

1. Substation and fence ground circuits to be tied at a minimum of two points.

2. Wire fence.

3. Bare copper wire (No. 1/0 min.) buried 12 in. and located 12 in. from fence. When fence is on or less than 12 in. from property lines, ground wire to be located on property line. Wire to be looped through ground rod and fence clamps to keep number of pieces of wire to a minimum.

4. Phos-copper brazing of all underground connections is preferred. Standard connectors (two per joint) may be used when brazing is impractical.

5. Additional buried wire to be used at all areas where gate swings outward.

6. One ground rod to be placed at each corner. Use additional rods if necessary (40 ft max. spacing).

7. Ground wire to be tied at all gate and corner posts and alternate intermediate posts. See Fig. 2 for connecting detail.

8. Fence fabric.

9. Cup washer (Fig. 4) and ⅝-in. galvanized bolt.

10. Fence post grounding clamps.

11. 8-ft ground rod and ground rod clamp.

12. Washer material—⅛-in. sheet copper, no finish.

NOTES

A. FENCE DISCONTINUITIES due to buildings, removable sections, etc, of less than 10 ft shall be bridged with a buried ground wire.

B. SPECIAL CONDITIONS. This standard applies to routine substation enclosures. Where any special conditions are present, refer problem to District Engineers, including cases where:

a. Underground metallic sheath or shielded cable is or may be used.

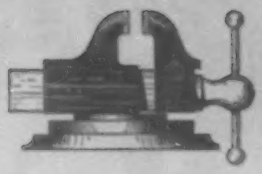
b. All conductors are underground.

c. Fence is over 25 ft from substation structure.

d. Fence is in metallic contact with foreign structures.

e. Wood Fences. When barbed (or other metallic) wires are attached and accessible from ground level, install ground grid, Fig. 1. Electrically connect wires together and to ground at all corners and ends; also at other points if necessary to keep within 40 ft maximum spacing.

ALL FARGO CONNECTORS* are "VISE-TYPE"



VISE TYPE?

. . . small proportion of applied wrench torque dissipated in friction to overcome connector distortion . . . high compressive force developed between conductors . . . vise type design protects bolt from weathering and joint sealing compounds — long thread engagements eliminates "stripping" . . . vise design makes possible one-piece connector—no loose parts to handle—no parts to engage during installation . . . built like a vise, grips like a vise.

5000 SERIES

. . . 5000 Series is a cast bronze one-piece connector giving maximum flexibility of wire sizes . . . available in 12 sizes covering range from #8 through 1000 MCM—permits most economical selection of connectors for your system.

8000 SERIES

. . . 8000 Series is a wide range bronze or plated bronze connector for use on distribution systems . . . spacer bar gives additional contact area between conductors and protects against galvanic corrosion in copper to aluminum joints . . . four connectors cover range from #8 to #4/0 ACSR.

9000 SERIES

. . . 9000 Series has extra wide contact areas for maximum conductor encirclement . . . well rounded corners minimizes danger of nicking conductor.

. . . thick, pure aluminum spacer when under pressure forms around the strands of conductor sealing out moisture or other corrosive media—reduces danger of electrolyte bridging gap between copper and aluminum conductors.

. . . cast in aluminum . . . available to handle aluminum to aluminum or aluminum to copper connectors from #8 through 500 MCM . . . plated connectors of same design are available for all purpose use.

Ask your Line Material Field Engineer for complete details.

* Patented

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N. Y.

Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

Tight

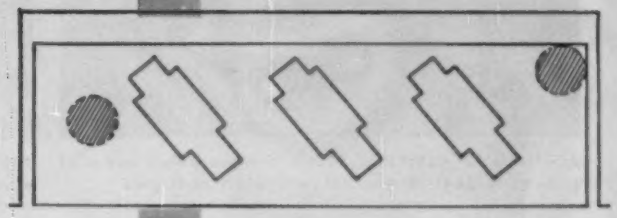
Transformers are unloaded from PG&E truck in front of partially finished building at northeast corner of busy Montgomery and Sutter Streets in San Francisco.

Transformer is lowered into much smaller than normal vault. Other three units went into same size vault close by. Low voltages are tied in with PG&E's secondary network system.

Spiral-wound gaskets. Over 6 years' continual use has proved their superiority over other types of gasketing material for sealing bushings in the tank wall. Alternate plies of preformed spring-like metal and non-metallic fillers provide unusual resilience and actually adjust themselves to changes in operating conditions. Gaskets can be installed without cement or grease. They can be quickly removed as required and may be re-used if necessary.

Squeeze in San Francisco

Compact network transformers and engineering ingenuity solve problem when vault is small



Sketch of vault shows how three 500-kva transformers were fitted into unusually small area.

PACIFIC GAS & ELECTRIC COMPANY'S network engineers had to test their ingenuity to provide power for the new Equitable Life Assurance Company building in San Francisco. It was a tight fit for transformers because building architects limited vault width.

PG&E engineers solved the problem by installing the units at a 45-degree angle. Even then it was a tight squeeze to get six 500-kva transformers in the space allowed.

For a job like this, compact design and reliable operation are vital. Not only must transformers fit into small size vaults, they have to provide trouble-free performance, because maintenance isn't easy.

PG&E used Allis-Chalmers network transformers for the job. These units have proved their reliability in hundreds of installations — over 1½ million kva are now in operation. They have the compact design and rugged construction needed for congested areas.

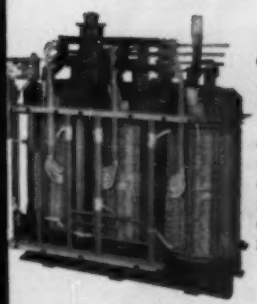
Before you consider your next network installation, get complete facts on Allis-Chalmers network transformers. Call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wis.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

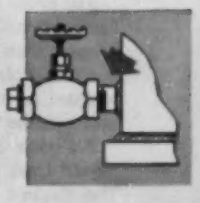
A-4711

Design and Construction Features



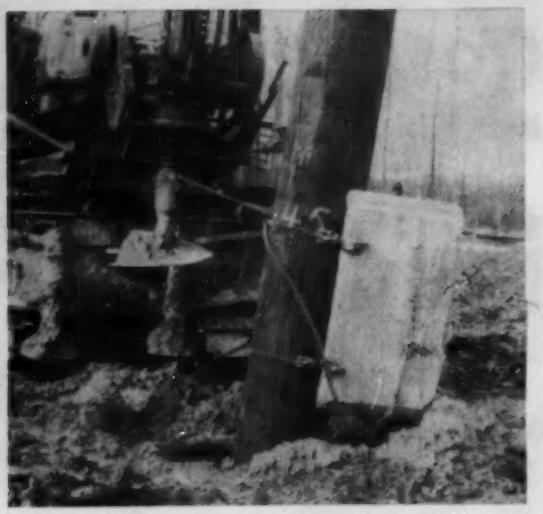
Compact, low-loss design. Thermal capacities are high for contingency load conditions. Sturdy, time-proved core and coil construction meets repeated short-circuit stresses of network operation.

Safe, dependable tap-changing mechanism. Handle inserted through two-inch opening on cover operates the tap-changing mechanism. Handle cannot be removed unless it is in positive tap change position.



Threaded valve connections to tank are tinned for extra protection. Valves are located for easy access. Globe-type valves with non-rotating seats close tight, avoid wear on valve seats.

ADDITION OF CONCRETE BLOCK changes pole's center of gravity, so 28-ft lift can be used to set 80-ft pole



AFTER POLE ERECTION, block is released by loosening and removing hoists, allowing block to tilt away from pole

Concrete Block Solves Pole Erection Equipment Problem

E. S. MORTIMER, Manager of Operations, Eastern Shore Public Service Co of Md., Salisbury, Md.

Making poles butt-heavy by temporarily attaching a concrete block to the pole permits setting 70 to 80-ft poles with a pole-setting truck having only a 28-ft lift.

A 1,000-lb concrete block is poured with one side hollowed out to fit a pole. Six eye-bolts, one in each end for handling and two in each side for fastening to the pole, are set in the block. Short sharp end reinforcing rods are imbedded in the concave face to grip the pole and prevent slippage during the pole setting operations.

When erecting a pole the block is placed on the ground hollow side up. The pole is then placed in the hollow so the block will be just above the ground line after the pole is set. Two chain hoists hooked into the block eye-bolts are tightened to hold the block and pole as a unit. The pole is then set in a standard manner and the block removed.

Forces of Day & Zimmermann Inc, perfected the method in cooperation with power company linemen.

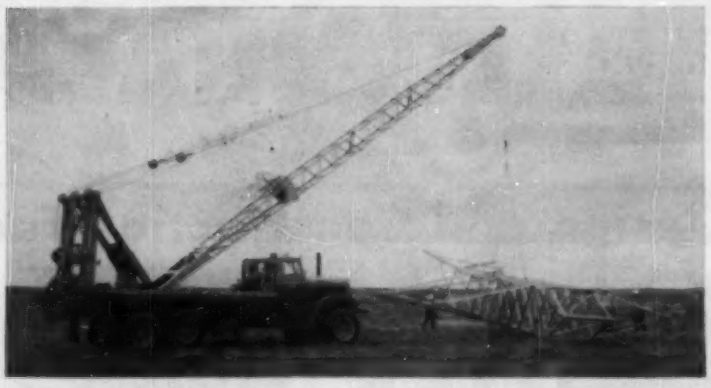
55-Ft Crane on Flatbed Truck Reduces Erection Time

J. F. SERVIS, Supervisor, Mobile Line Crews, Idaho Power Co, Boise, Idaho

A truck that mounts a 55-ft boom and converts into a heavy-duty hauling unit saves Idaho Power Co time and money. Using the boom, up to 36 two-pole, 230-kv transmission towers have been set in one day. With the boom erecting the lower portion of steel towers and a 110-ft crane topping them, nine 105-ft towers were completed in 8 hr.

The boom also may be used to place heavy transformers on high racks faster than the block-and-tackle method. Pole-top switches can be assembled on the ground and set as a unit with the boom.

All parts of the crane can be removed from the truck in about 3 hr. The flat-bed unit has carried up to nine reels of conductor (54,000 lb) across desert country.



SAFER OPERATION of 55-ft crane is obtained by working the boom over the cab of a 6-wheel drive truck. Boom is controlled hydraulically from the cab

The crane is mounted on a 6-wheel drive, flat-bed truck. The boom consists of two 17.5 ft and two 10 ft sections, with a sheave on the boom

(*Continued on page* 139)

One step in the miniature production of clay in the O-B Pilot Plant -- removing surplus water in a small, experimental filter press. Through the window above the operator can be seen part of the battery of production filter presses in the main clay department. It is far more than a mere figure of speech to say that research and production are only a thin partition apart.

Research and Production

only a thin partition apart!

Most manufacturers suspect they could improve their product. But, to experiment with production adds, on top of direct cost, the still higher costs of interrupted output and unfilled orders. In most cases this would be ruinous. Therefore, development drags its feet.

Think of insulators for a moment. They are one of the very few products where the manufacturer starts with the rawest of raw materials -- clay right out of the ground, converts it into a finished product in one plant, and sells it direct to the consumer. In so integrated a piece of production, large-scale experiments would produce a work stoppage. We couldn't afford it.

But we *can afford* complete duplication of our porcelain manufacture in miniature. Here, we can't obstruct production because there isn't any. Our Pilot Plant has only one product -- ideas: only one job -- to keep an eye on present quality, and to make it better!

This capsule-size factory within a factory has put a lot of improvements into the O-B insulators you use. It can afford to try new things. And *we* can afford to *let it try!*

Read the description of O-B's Pilot Plant on the next three pages. You will readily appreciate this highly practical application of Technical Competence -- the heart of every O-B insulator.

OHIO BRASS COMPANY, MANSFIELD, OHIO

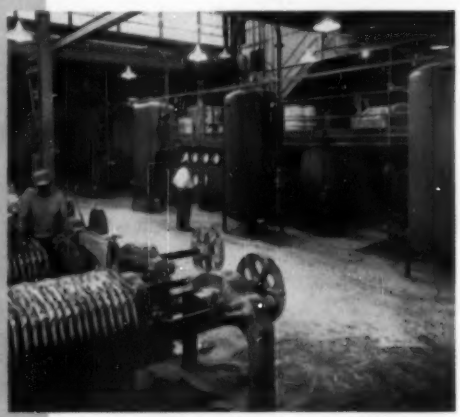
In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

Research and Production

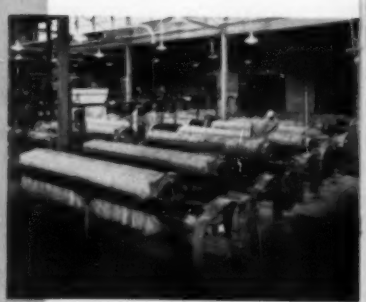
only a thin partition apart!

A few pounds of native clay are collected for the Pilot Plant, in contrast to the automatic batching equipment used for factory production. Dust, which was once a nuisance and a health hazard in batching is handled by elaborate exhausting systems. Each component of a porcelain mix, as it is drawn from its huge bins, is weighed and recorded. Lack of accuracy here would throw all subsequent production out of gear. But, the direction of this process is controlled, and its correctness is proved-out by the man who gathers a few pounds of clay for the Pilot Plant.

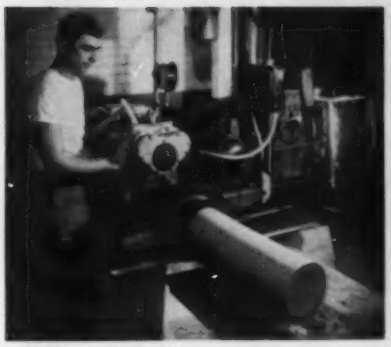


Raw clays are mixed with about equal quantities of water to make the "slip" of electrical wet ware porcelain. This thin creamy material is stirred, recirculated by pumping, and filtered in a long preparatory process. Hundreds of tons a day go through the mixers of our clay department—a few pounds a day go through the "pint size" mixer in our Pilot Plant. It is of interest to note that, behind the operator, the window opens into the main clay department of the O-B plant.

After extensive mixing and filtering, the semi-liquid slip is pumped under high pressure into a filter press which removes surplus water. Product of the filter press is a circular "press cake" of putty-like consistency -- the raw material from which insulators are formed. The laboratory model of filter press was featured on the first page. Its capacity is measured in pounds. The factory production equipment turns out hundreds of tons of insulator clay, with the industry's most modern installation.

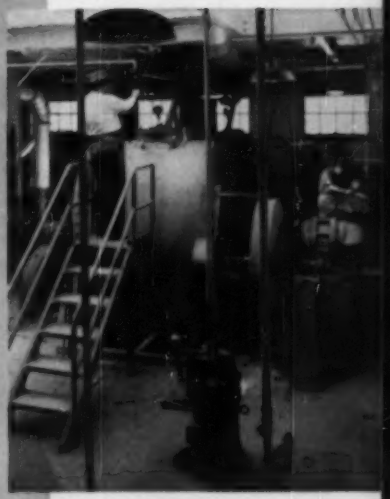


To reduce press cakes to workable shapes, and to remove all entrapped air, the pug mill shreds the clay under a high vacuum and ejects it in cylindrical form which is cut to desired length by taut steel wires. Tons of clay per hour go through the factory mills, while a few pounds are processed in the laboratory. On the small mill, various size pugs are produced; slender rods for comparative purposes and larger sizes as shown, from which actual insulators are experimentally formed.



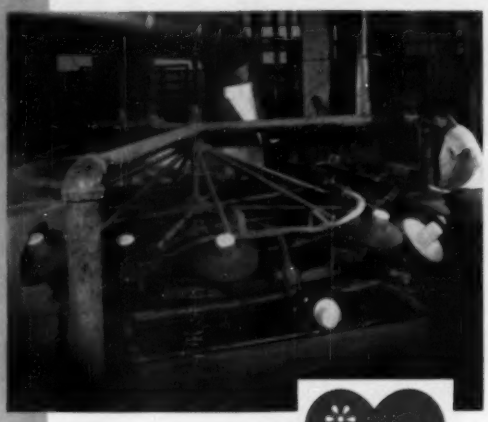
Major portion of O-B's factory production is fired through three huge tunnel kilns of tremendous capacity. Illustrated is the burner section of one of these kilns during calibration with an optical pyrometer. To obtain complete firing flexibility for small quantities, however, the Pilot Plant uses a fully automatic experimental kiln capable of running on pre-set schedules of heat and time. In the picture a technician is checking the sag of a set of experimental test bars, since slight sag of the product is an element in attaining final shape.

Glazing clays are reduced to extreme fineness in a ball mill. The charge of clay and water is mixed with grinding balls and rotated for a long period in a drum. Both laboratory and factory equipment do the same job, but on a somewhat different scale.



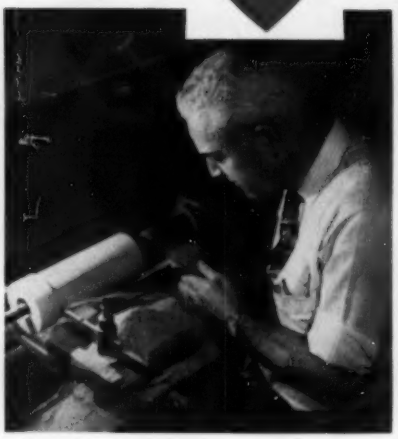
Research and Production

only a thin partition apart!



Glaze adds materially to suspension insulator strength, and one element of this glaze application is exact thickness. This is obtained by automatic dipping -- a process inaugurated 18 years ago in the O-B plant. Since speed of the machine is fixed, thickness of the coating is a function of density and viscosity of the glaze bath. Experimental glazes, as well as production samples, are applied in the Pilot Plant by means of a single-spindle machine, driven to specified speed, with dipping time controlled by a stop watch. Here, variations can be tried or factory conditions can be duplicated at will.

In an air-dry condition, similar to common chalk, porcelain is often formed by turning. Tool shape, cutting angle, speed, and many other factors must be carefully worked out to avoid setting up incipient checks that will lead to cracking in the heat of the kiln. Experimental shapes are processed in the Pilot Plant to determine best factory production conditions, thus avoiding wasted time and material.



You have seen a few examples of O-B's "Factory Within A Factory" -- the Pilot Plant -- the place where they can afford to try new ideas, because ideas are their only product. This is the intermediate step between the purely technical laboratory and the practical factory. It interprets theories into materials. It constantly watches and questions the quality of factory output, and is always on the alert to discover something better. It does things in miniature and at small cost which would be impractical on a factory-wide scale. It clears the track for men's imagination and ingenuity that would otherwise be hampered by the heavy penalty of delayed production. It is the essence of technical competence -- the heart of every O-B insulator!

TECHNICAL COMPETENCE **the heart of every Ohio Brass insulator**

4513-H

55-Ft Crane

(*Continued from page* 134)

JOINT IN BOOM lowers the crane to 14 ft for traveling over highways

point. At the top of the lower 17.5-ft section is a joint which operates hydraulically. Two 30,000-lb winches control the boom and load line.

Four hydraulic rams, one located at each corner of the truck, operate between the truck frame and axle. They allow the truck bed and boom to be leveled or stabilized. The rams also allow the point of the boom to be moved 3 ft to either side of the truck's center line. This feature aids in positioning poles, towers, or equipment. It eliminates "juggling" the truck or using the push and strain method to move a heavy object a few inches.

The boom extends over the front of the truck. This increases safety by allowing the operator to observe all work in a forward position rather than over his shoulder. All controls are hydraulic and are easily accessible to the operator in the cab.

When the boom is in traveling position its vertical clearance is 14 ft. Maximum speed of the truck is 40 mph. The boom can be changed from an upright to traveling position in less than a minute.

Silver-Iodide Seeding Increases Rain by 15%

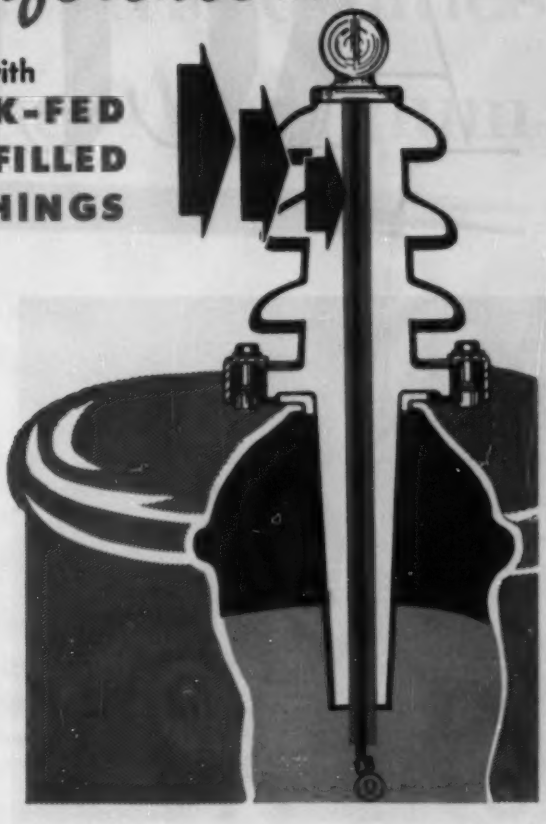
Mexican Light & Power Co has produced artificial rain with good results since 1949. Seeding the clouds with silver-iodide crystals from an airplane has increased annual precipitation in the Necaxa watershed by 15%.

In operation, silver-iodide powder is passed through an electric arc to

(*Continued on page* 143)

RT & E *transformers are free from radio interference...*

with
WICK-FED OIL-FILLED BUSHINGS



Radio and television interference has existed in distribution transformers, due to corona inside the high voltage bushing. This corona and interference effect has been eliminated in R T & E transformers by the use of fiber glass filled bushings which extend into the transformer oil and provide wick-fed oil-filled bushings.

R T & E transformers are radio and television interference free even at 120% of rated voltage.

R T & E transformers have many other exclusive design advances that will save you time and money.

WRITE FOR CATALOG AND PRICE INFORMATION

632 N. 8TH ST. MILWAUKEE 3, WISCONSIN

RT&E Co.

BRANCH PLANT WAUKESHA, WISCONSIN

Action!

Action! on sales service for an Illinois utility by a Kaiser Aluminum sales engineer who delivered vitally-needed accessories in less than 24 hours!

Action! for an Arizona utility when Kaiser Aluminum engineers provided "invaluable" field assistance on an installation of weatherproof!

Kaiser Aluminum services available to you:

Field Service—Experienced Kaiser Aluminum field engineers are available to work with your crews on stringing jobs; demonstrate ways to speed installations and cut costs.

Engineering Service—Kaiser Aluminum engineers and specialists work with you in power system planning and design; furnish technical information such as stringing sag tables and sag-and-tension charts on request; help keep you up to date on latest construction techniques; help solve specific installation problems.

Laboratory Service—Kaiser Aluminum laboratories continually evaluate accessories, enabling us to suggest accessories and installation procedures designed to give you maximum service and economy. They offer assistance on phases of your operations involving fundamental research. They also continually check Kaiser Aluminum conductor to insure consistent high quality.

Delivery Service—Kaiser Aluminum's reputation for on-time delivery is unsurpassed in the industry.

Kaiser Aluminum distributor coverage is the best in the country. There's a distributor conveniently located to serve you, wherever you are. His many services include: large stocks of Kaiser Aluminum conductor, fast delivery to help reduce your inventory, up-to-the-minute information to help keep you abreast of latest developments, friendly, personal attention to any size order.

You get these complete services at no extra cost when you specify Kaiser Aluminum conductor.

...that's what electric utilities get from Kaiser Aluminum

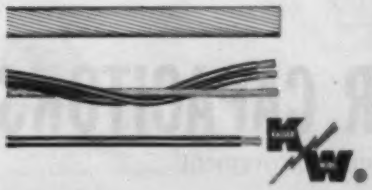
Action! from the mill that put 40,000 pounds of conductor in a Kansas City utility's hands in less than 24 hours—preventing a costly work stoppage!

Action! on engineering service for a large eastern utility that helped them solve a tough river crossing by developing new methods and techniques!

THOUSANDS of our customers will tell you that Kaiser Aluminum's kind of service gives them *faster action, more effective action* than they've ever had before!

If it's action *you* are looking for, day after day, we invite you to prove to yourself—with your next order—that Kaiser Aluminum is the one best place to get it!

For immediate attention, contact the Kaiser Aluminum sales office listed in your telephone directory or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.



Kaiser Aluminum

setting the pace—in growth, quality and service

Polyethylene & Neoprene Weatherproof and Triplex • Quadruplex • ACSR
All Aluminum Conductor • Rectangular, Solid Round and Tubular Bus

Imagine the wrath of this boy . . . and thousands of others in his community . . . if power outages cut off the TV at the "crucial moment". That's where C-D's field-proved dependability pays off . . . regardless of changing weather or power load conditions. The thousands of C-D power capacitor installations . . . all with records of better than 99.6% trouble-free service . . . have proven C-D BEST BY FIELD TEST in its contribution to the high continuity of utility service. Consult C-D to learn how you can get more for your capacitor dollars with C-D.

CORNELL-DUBILIER CAPACITORS

consistently dependable for power-factor improvement

PLANTS IN SO. PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY, RADIART CORP., CLEVELAND, OHIO

CORNELL-DUBILIER
power-factor capacitors give you better than 99.6% trouble-free service*

Low dielectric unit stress provides an extra margin of safety that results in the ability to withstand higher transient voltages. When you buy C-D, you buy premium quality at no extra cost.

Extra strength wet process two piece porcelain terminals . . . one of the many important reasons why C-D capacitors can point to year after year of trouble-free service in coastal areas.

Another evidence of C-D's premium quality power capacitor service . . . at no extra cost . . . is the fact that C-D has no "Return Material Department". Most repairs are of such a minor nature that they are handled on an individual basis. This results in a prompt, personalized service impossible where the safety factor has been cut in favor of production, weight and size economies.

C-D's rack capacitors are shipped completely assembled ready for energization. Again C-D's conservative engineering standards provide the structural strength to do this and as a result save the utility time, assembly and installation costs in the field.

Why is it that only C-D power capacitors give you assurance of complete dependability?... because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.

Part of a 37,000 KVAR C-D installation at substations of a large Western company.

This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and some lower than 99.9%.

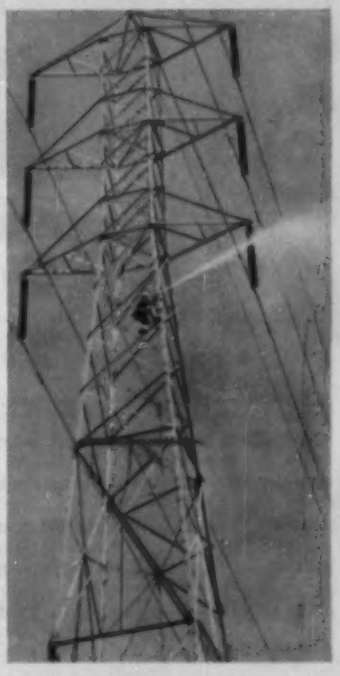
Cloud Seeding

(*Continued from page* 139)

vaporize it. Then the vapor is distributed through a ventilating system as the plane passes over the clouds. The small silver-iodide particles aid the formation of ice crystals which develop into snowflakes and then turn into rain as they fall through warmer air to earth.

This year, beginning June 1 and continuing through October, three flights a week will be made to seed clouds, whenever atmospheric conditions seem favorable. In addition, four ground generators will also be operated three days a week to produce rain.

The ground generators have a large wick that is soaked in a solution of silver iodide dissolved in acetone. When the wick is burned, the chemical vaporizes and is carried up into the clouds by the natural updrafts.



Tubular Riser on Tower Aids Insulator Washing

H. D. FISCHER, *Jr.*, Transmission Division Engineer, Southern California Edison Co, Los Angeles

Insulator washing on steel tower lines is made easier through the use of a riser up one of the tower legs.

(*Continued on page* 146)

Custom-

to give you

"More than just a Truck-"

The very concept and design of FWD—the *original* four wheel drive truck—correctly proportions power to weight on all wheels, puts the power where there's work to be done. There is no better answer to your heavy duty problems because FWD is the truck that starts where others stop. FWD gets jobs done where conventional trucks can't even travel. Bring your heavy duty problem to FWD for a custom-engineered answer. You'll be talking to a Four Wheel Drive specialist.

FWD MATH-MATIC DESIGN

More Driving Power

Less Dead Weight thru Lighter Alloys

Greater Load-Carrying Capacity

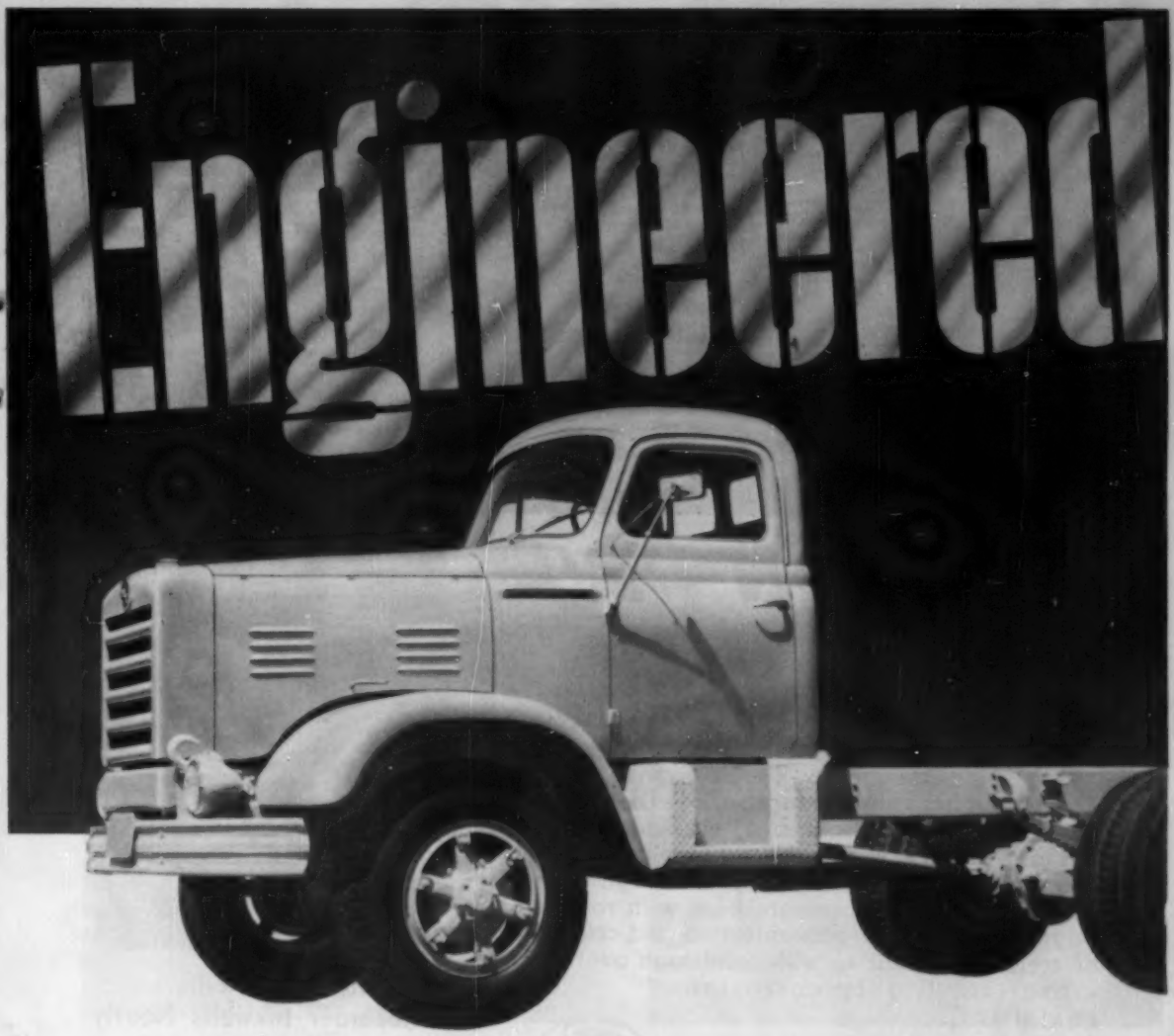
Gets to More Jobs . . . Gets More Jobs Done

Greater Controllable Traction

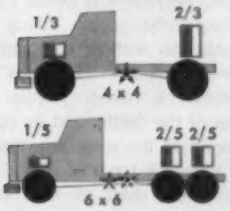
Improved . . . and Proved Driving Safety

THE FOUR WHEEL DRIVE AUTO COMPANY

Engineered



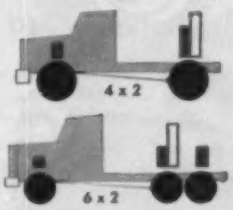
FWD WITH ADVANCED MATH-MATIC DESIGN



Note how power is correctly proportioned to weight distribution.

P Proportion of power on each axle

ORDINARY REAR-WHEEL-DRIVE TRUCKS



Note how power is wastefully concentrated on one axle.

Proportion of weight on each axle

Advanced Math-Matic Design—in every feature of FWD—correctly proportions power to weight on front and rear axles . . . making every pound of load help haul itself! Each wheel's load adds driving power, turning every ounce of torque into more controllable traction, greater steering safety. *WRITE OR CALL for (1) your free copy of illustrated product folders in weight categories from 14,500 to 60,000 lbs. GVW. (2) your copy of "The Truck That Went to College"—scientific proof of four wheel drive superiority.*

FWD MATH-MATIC DESIGN

BUILDERS OF AMERICA'S FOREMOST HEAVY-DUTY TRUCKS

CLINTONVILLE, WISCONSIN • *Canadian Factory,* **KITCHENER, ONTARIO**

DOSSON "F" SPLIT BOLT CONNECTOR

Fabricated from high strength alloys (better than average steels), the Dosson "F" is cold-formed for uniform quality. Maximum contact pressure is assured by a high translation of tightening torque. Full length pressure bars with rounded edges prevent load concentration and crushing of conductor. Built to withstand high overload, vibration. Highly corrosion resistant.

Mail coupon for FREE Dosson "F" Connector

DOSSERT MFG. CORP.
249 Huron St., Brooklyn 22, N. Y.

Gentlemen:
Please rush free sample Dosson "F" Split Bolt Connector plus catalog sheet.

Name _____ Title _____
Company _____
Address _____ Zone _____ State _____
City _____

50 YEARS OF TECHNICAL ADVANCE

DOSSERT MFG. CORP.
249 Huron St., Brooklyn 22, N. Y.

Riser on Tower

(*Continued from page* 143)

Connections on the riser at three levels for the hose and nozzle allow the operator to use a shorter length of hose for greater convenience and safety.

The riser consists of copper tubing clamped with steel straps which are bolted to the tower leg. High-pressure water is supplied to the riser from a tank truck through a connection at the tower base. Water used for washing has a minimum resistance of 500 ohm per cu in.

Risers are installed on all two-circuit tower lines in industrial and residential areas. With a 10-ft length of hose, one man can wash all portions of the insulators, particularly those that could not be reached from a truck-mounted washing rig.

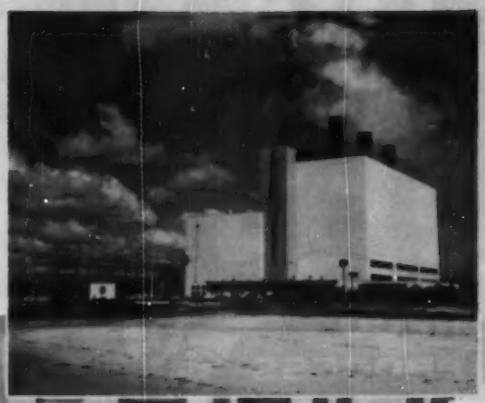
Plastic Bottle Fills Recorder Inkwells Neatly

W. H. JONES, Philip Sporn Plant, Central Operating Co, New Haven, W. Va.

A flexible polyethylene bottle fitted with a long tube speeds filling of recorder inkwells without drippage at the Philip Sporn plant. The tube extends through a rubber stopper to the bottom of the bottle, and its outer end is sloped at the most convenient angle for filling all types of inkwells.

Squeezing the sides of the bottle dispenses a drop or a stream of ink. When pressure is released, ink is drawn back into the bottle, thus preventing dripping. Because the tube isn't dipped into ink, as would be required with a commonly used eye dropper, further dripping is eliminated.

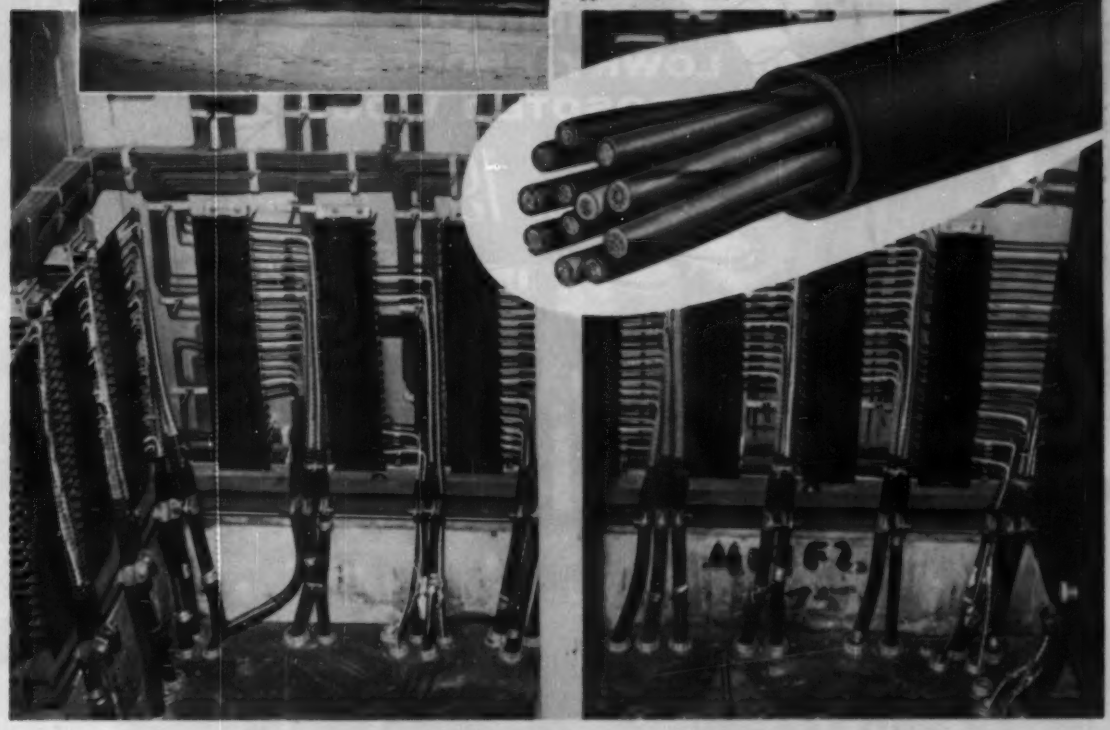
Time has been saved in filling a large number of wells by standardizing on one ink and using a relatively large bottle with a high dispensing rate.



FLORIDA POWER CORPORATION

EXPANDS CAPACITY

Higgins Plant, Oldsmar, Florida



USES ROCKBESTOS PNR®

SMALL DIAMETER CONTROL CABLE

Since 1946 Florida Power Corporation has been expanding its generating capacity so that at the end of 1955 it will have a generating capacity of 491,000 kw.

To insure safe dependable operation of its control circuit Florida Power Corporation installed 207,600 ft. of No. 9AWG Rockbestos PNR Small Diameter Control Cable.

You, too, can benefit with Rockbestos PNR. This outstanding control cable lets you pull 12 conductors in conduit where before you had only seven. You save conduit and fittings . . . cut installation costs. Get the full story today. Write or call your nearest Rockbestos Field Engineer.

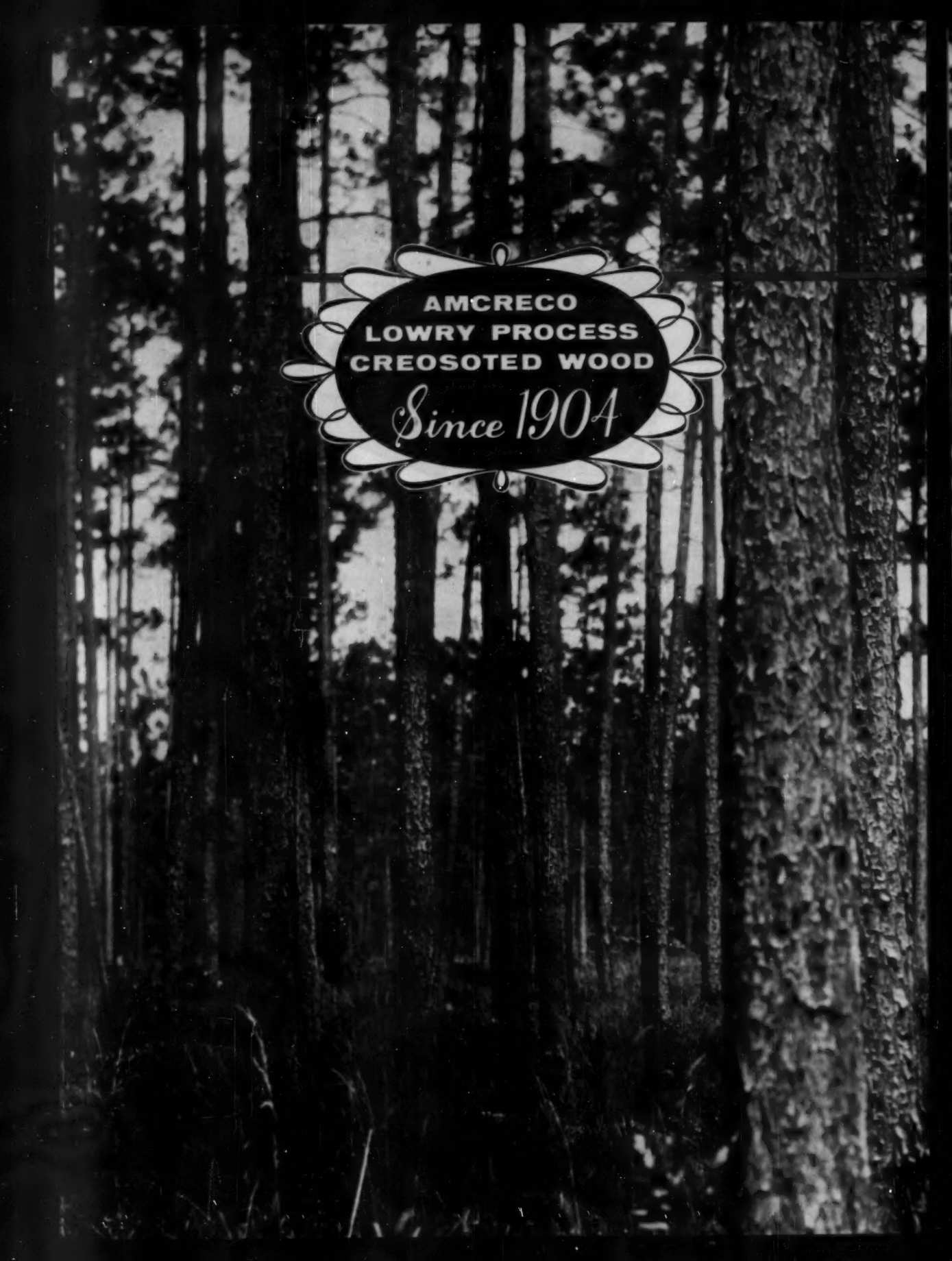
*Average determined by comparison with conventional control cable.

PROPERTIES OF PNR

46% smaller in area* . . . 28% smaller in diameter* than conventional control cable.
Use smaller conduit and fittings or put more conductors in existing conduit.
Lighter, easier to handle, store, ship, pull through conduit.
Dielectric breakdown . . . over 40 times operating voltage.
Rated 600 volts . . . conductor operating temperature 167°F.
Flexible from 167° to —67°F.
No cracking!

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONN.

NEW YORK • CLEVELAND • DETROIT
CHICAGO • PITTSBURGH • ST. LOUIS
LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA


AMCRECO
LOWRY PROCESS
CREOSOTED WOOD
Since 1904

50th Anniversary of
AMERICAN CREOSOTING COMPANY
Pioneers in Forestry as well as Wood Treatment

. . . for Lower Cost, Longer Lasting Wood Products

It has been estimated that the modern wood preserving industry, pioneered by the American Creosoting Company, has saved the nation the equivalent of 500 million acres of forest lands in the past 50 years. Great as this force has been, wood preservation alone was not enough to stem the tide of forest exhaustion. Additional measures were needed to extend the life of our forests and assure the nation of a plentiful wood supply.

The greatest conservation force is, and must continue to be, the forester and his science of forestry. Reduced waste of timber gave him the chance to prove that good forestry practices will win the battle against depletion.

Just as it was the pioneer in wood preservation, American Creosoting Company was a pioneer in forestry. While the science of forestry was in its infancy, American Creosoting Company took a practical interest in the advancement of the science by purchasing large forest areas to make them available for the study and advancement of the practices of good forestry.

In this vast woodland laboratory, known as Satilla Forest, Amcreco has helped develop and carry out many of the scientific practices that are now in widespread use throughout private, industrial and government owned timber lands. Satilla forest is known and recognized by authorities as an outstanding example of forestry management. In addition to serving as a laboratory for the development of man's knowledge in forestry, Satilla has also provided Amcreco with a great amount of fine timber for treated poles, cross arms and other construction woods.

Hand in hand with its experiments in forestry, the American Creosoting Company has helped develop wood preservation to the fine art that it is today. The results of these efforts — wood, pressure treated in creosote by Amcreco, lasts for years and years with great strength throughout the life of the wood, and under many conditions, wood treated by Amcreco can be considered essentially permanent.

If you've never been an Amcreco customer — if you've never profited by our years of experience, strategically located treatment plants and sales offices, contact us on your next job. We would appreciate an opportunity to quote on your needs.

This year the United States Forest Service also celebrates its 50th anniversary. We are proud to share our birthday cake with them and to join the nation in thanking them for their invaluable contributions to conservation.

AMERICAN CREOSOTING COMPANY

Shreveport Creosoting Company
Colonial Creosoting Company
Federal Creosoting Company
Indiana Creosoting Company

AMCREO
LOWRY PROCESS
CREOSOTED WOOD

Georgia Forest Products Company
Gulf States Creosoting Company
Georgia Creosoting Company
Kettle River Company

INDUSTRIAL APPLICATIONS

Ultraviolet Lights Punch Colds in Nose

LEON ALBERTSON, Application Engineer, Philadelphia Electric Co, Philadelphia, Pa.

Ultraviolet light is dealing the common cold a heavy nose-blow among candy workers in Chester A. Asher's confectionery plant in Philadelphia. Installed throughout the plant and in rest rooms, the lamps have sliced absenteeism 50% and have stopped moths and molds from spoiling nuts and chocolate.

Formerly a cold infection would spread from one worker to another. This, of course, resulted in a serious loss of time. But now the chain reaction does not occur.

Asher's has used ultraviolet for about five years with such satisfaction that it has installed new units periodically. Company officials have found that they increase the general plant efficiency and operation, and help improve the candy products.

Each fixture holds one 30-w lamp. Minimum recommended mounting height is 7 ft above the floor. It is important that the lamps be above the line of vision.

The spacing for a new installation depends upon the degree of effectiveness required, the ceiling reflectivity, and type of fixture. Design criteria also include ceiling height, the room's area and volume, air changes and hours of operation.

ULTRAVIOLET LAMPS (nearest ceiling) were installed in this confectioner's plant to keep colds from "freezing" production by breeding employee absenteeism

INDUSTRIAL NEWS NOTES

Eyes on the Skies

London's notorious fogs are being thwarted electrically by antimony cells which switch on hangar lights for the British Overseas Airways Corp at London's remodeled airport. The photocells are mounted beneath the hangar's glass roof. They generate signals which trip relays automatically when darkness or a "pea-souper" rolls in. The circuit is purposely sluggish: thinner, "consomme-type" fogs won't make relays chatter.—McGraw-Hill World News.

•

"Insidious Troubles"

In the bulletin circulated to its industrial customers, New Orleans Public Service Inc hit inadequate industrial plant wiring hard by showing what happens when voltage drops 10% due to overloaded wires. Some consequences are: a 31% drop in incandescent lighting output, fluorescent tubes starting with difficulty—if at all, a 19% slash in heat delivered by electric elements, and an 11% increase in current to running electric motors. The bulletin asked: "Can your plant afford **not** to have adequate wiring?"

•

Robot Cost-Cutter

Automatic handling, inspecting and testing of speaker magnets is attracting the attention of cost-conscious experts at GE's Carboloy plant at Edmore, Mich. Using 16 ft of "automated space" and a pair of electronically controlled machines, two employees have tripled speaker magnet production. They turn out 2,100 magnets an hour, all checked for defects. Abnormal magnets get the trap-door treatment.

Sliderule Heat

A sliderule for determining the time required to heat steel sections in a salt bath is available from Ajax Electric Co, Philadelphia 23, Pa., when requested on company stationery. It covers heat-up times of steels up to 3 in. dia, at any temperature from 400F to 2,400F, and in chloride or nitrate salts.

•

New Life for Old Ovens

When old industrial ovens start dragging their productive feet, try adding an infrared booster to preheat the product. This enables the old equipment to bake, dry, and cure the products faster. The result is lowered unit costs, according to Jensen Specialties, Inc of Detroit. The company markets a booster that integrates with new ovens too.

West Penn Power Company selected Gulfcrest Oil to lubricate this 140,000 kilowatt unit on the basis of its outstanding performance in the other turbines at their Springdale, Pennsylvania Plant.

—they looked at the record and again selected

GULFCREST OIL

When the West Penn Power Company looked at the record of Gulfcrest Oil in its seven turbine units at Springdale, the choice of lubricant for Number Eight was no problem—Gulfcrest again!

Here's what the record showed: In each of the seven units the original fill of Gulfcrest had been in service for years without any significant changes in its characteristics. And of course the turbines operated continuously and dependably during this period.

A record like this did not just happen. It is the result of careful selection of crude oils that are thoroughly refined, then super-refined by Gulf's exclusive Alchlor Process, which removes the unstable hydrocarbons that remain after normal refining. This discarded portion, if allowed to remain in a turbine oil, accelerates oxidation, increases neutralization number, forms sludge, and harmful acids.

So to insure safe, long-lasting protection for your turbines, specify Gulfcrest—the world's finest turbine oil. Contact your nearest Gulf office today and have a Gulf Sales Engineer recommend the proper grade.

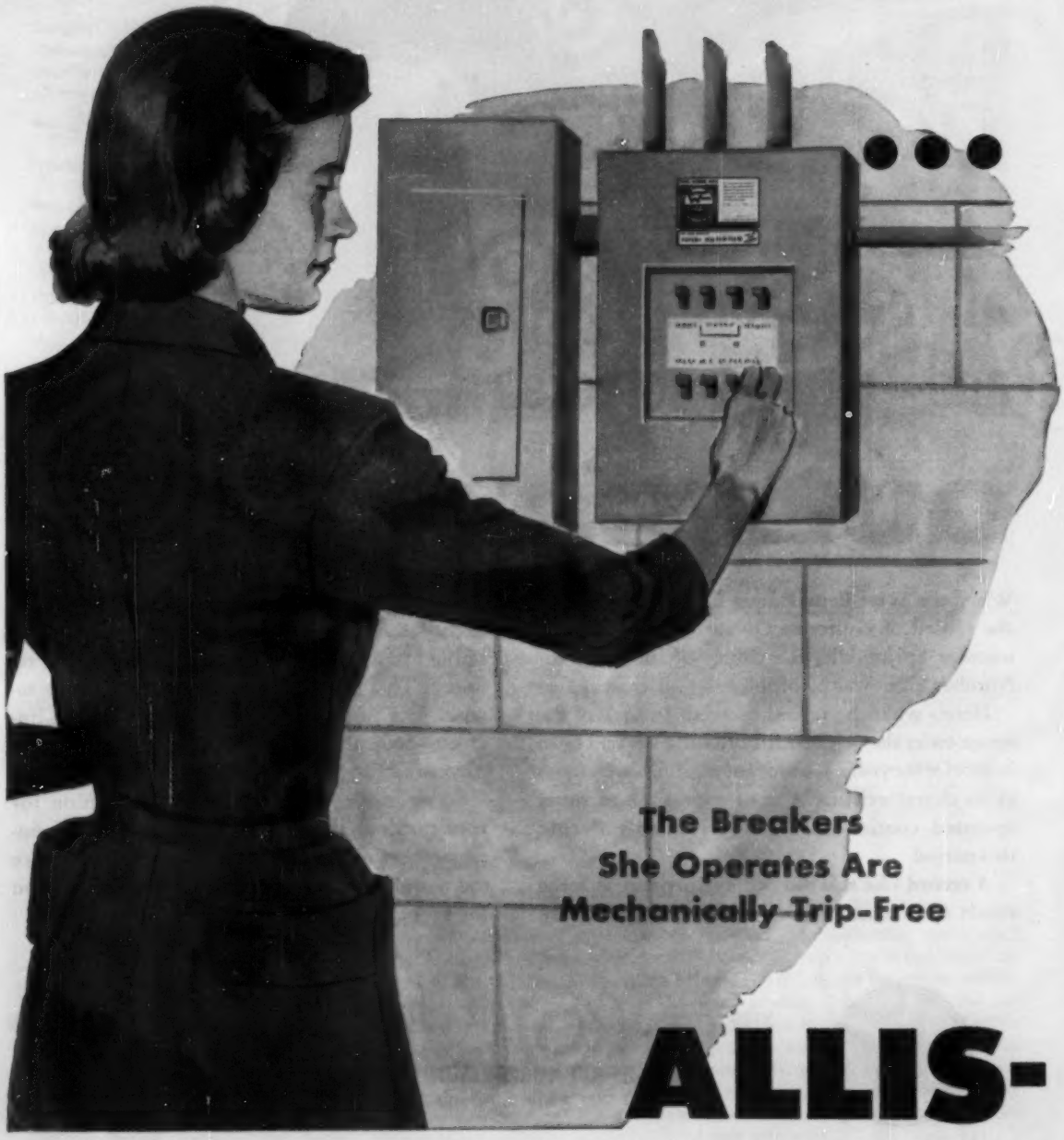
GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

GULF OIL CORPORATION • GULF REFINING COMPANY

1822 GULF BUILDING, PITTSBURGH 30, PA.

Safe Breakers Mechanically



The Breakers She Operates Are Mechanically Trip-Free

ALLIS-

are Trip-Free are yours?

The breaker shown is 230 kv, 10,000,000 kva.

Only Allis-Chalmers builds *all* breakers mechanically trip-free *without qualification.* Only in mechanically trip-free breakers are contacts and mechanism uncoupled — enabling contacts to open without restriction from mechanism.

For information call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4504

A-C CHALMERS

Pat. Pend.

*KLEIN KUT PLIERS

for both regular and heavy-duty cutting

It was Klein that produced the first and still the finest regular side-cutting plier. Klein also gave the industry the modern, streamlined version so much in demand.

And it's Klein again with a new, high leverage cutting plier for light- or heavy-gauge wire, including No. 2 weatherproof hard drawn solid copper wire, and A.C.S.R.

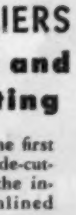
There's no extra hinging of any kind—no uncomfortable,wide-spread handles—with this new Klein-Kut Plier. The offset hinge permits the extra-high leverage and operation is as smooth and easy as with any other Klein Plier. Forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Ask for No. 213-9 N.E. for streamlined pattern.

Regular pattern available

Same high-leverage design, but in the original Klein side-cutting pattern. Ask for No. 213-9.

Write for free Copy of Bulletin 1054

*Trade Mark



ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

"Since 1857"

Mathias KLEIN & Sons

And in the Heating Field . . .

• *Underground heater ups lazy oil well output*

An electric oil well heater, which operates at 15 kw on 460 v, has been designed for N. W. Curson & Associates to step up the production of low-output wells.

Using six 80-in. heater units connected in pairs, the 18-ft device warms the heavy, sludgy crude, lowers its viscosity, and makes it easier to extract.

Wells that had been producing only five barrels a day have turned out as much as 45 barrels a day under the heater's earth-warming influence. Larger heaters now are being built.

General Electric Co

• *Vinyl jackets rival leather in quality, price*

ADM. J. J. CLARK, Vice-President, Radio Receptor Co, Inc, Brooklyn, N. Y.

New dielectric heating equipment has enabled S. Buchsbaum Co of Chicago to manufacture plastic sports jackets that will compete on a low-price basis with leather jackets of similar types.

First attempts to produce a vinyl plastic jacket were not satisfactory. Material sometimes tore when the sewing machine needle pierced it. Electronic sealing machines promised a solution to the problem, but adaptations had to be made.

Modifications on these 3- to 6-kw machines included raising the oscillator frequency, because the material is thin and electrode voltage had to be reduced proportionately. An arc-suppression device, sensitive to changes in load resistance, was inserted to trip off the plate current when the plastic material broke down electrically. Signalled by a flashing light and buzzer, the operation of this device prevents the die from pitting. Interlocks kill the power when the cabinet doors are opened.

The machines can be run by untrained personnel. Despite this, the current product is said to be far superior to the sewn jackets in strength and appearance.

Mass production is now possible, and labor costs can be reduced. Each part of the jacket—the sleeve, collar, pocket, buttonholes—is sealed in a single two-second operation.

• *Electronic machine seals plastic bags quickly*

L. J. LANGEVIN, Power Engineer, Cincinnati Gas & Electric Co, Cincinnati, Ohio

A high-frequency dielectric generator is saving time for Safegard Corp, Cincinnati, Ohio, by sealing plastic bags rapidly. Once the machine is set for a given job, it is a simple matter to duplicate the sealing operation repeatedly.

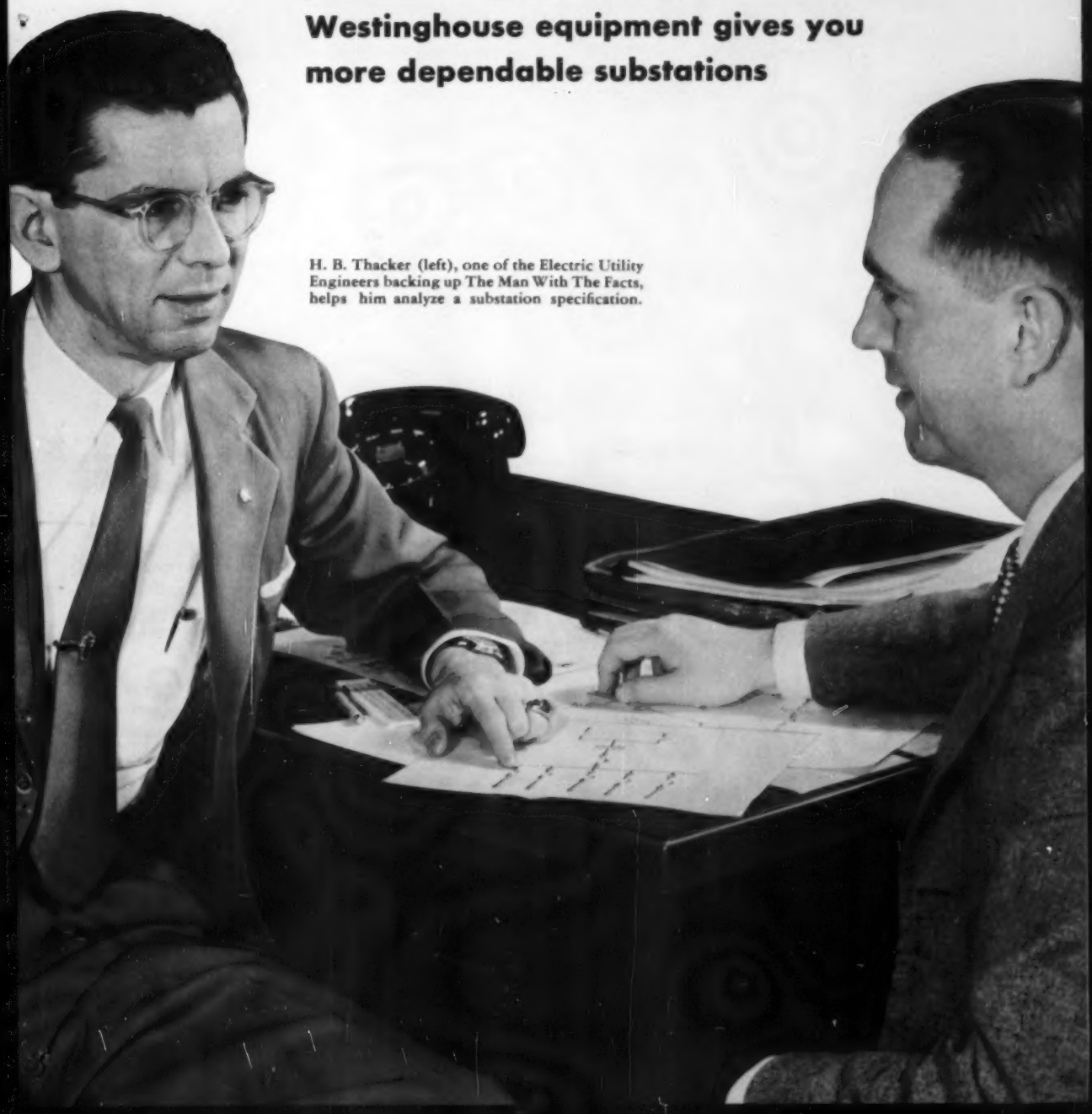
The unit is powered by a full-wave rectifier tube section which feeds the oscillator tube. The generator is rated ¾ kw, 25/35 mc output, and is energized from the 240-v, single-phase line provided for the plant by the utility.

A metallic band acts as the upper electrode or condenser plate. It is moved down on the work automatically by a cylinder. The metallic work table serves as an electrode or plate of a condenser. It is grounded for the safety of personnel.

A selector switch controls the amount of power fed to the plastic bags. A timer controls the duration of applied power. A bag can be sealed in a second or two, depending upon the thickness of the plastic.

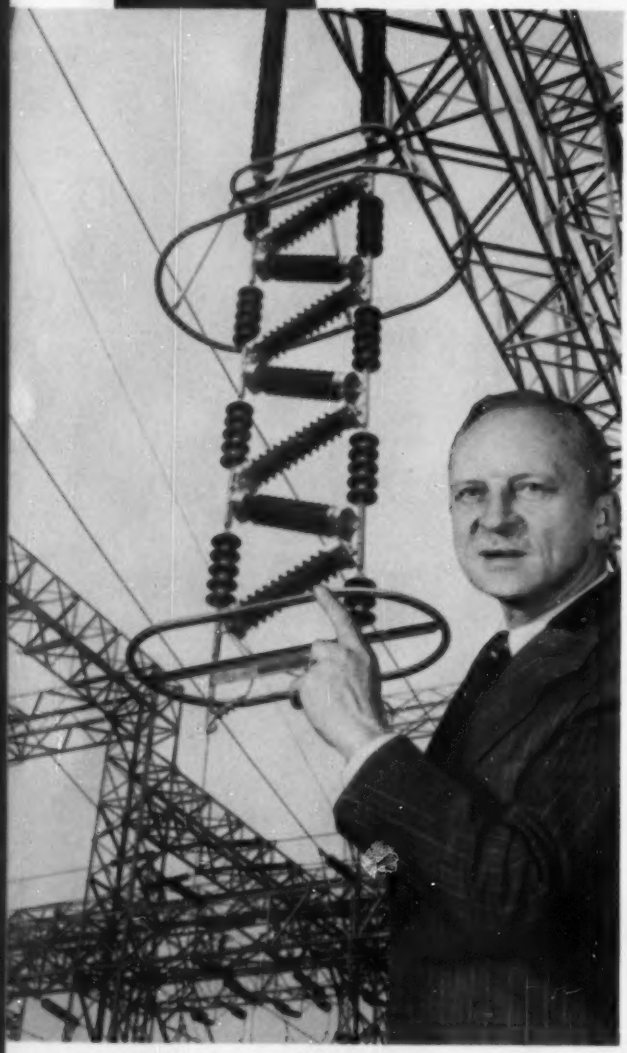
The Man With The Facts

. . . Your Westinghouse sales engineer . . . presents vital facts on how Westinghouse equipment gives you more dependable substations



H. B. Thacker (left), one of the Electric Utility Engineers backing up The Man With The Facts, helps him analyze a substation specification.

FACT:
Improved arrester performance gives more dependable and economical protection



Backing up The Man With The Facts is Ed Beck, Manager, Lightning Arrester Engineering. Lower discharge voltages of station arresters, he points out, mean expanded protection zones, therefore fewer arresters at many substations.

In both the Westinghouse station "SV" and line-type "LVS" arresters, maximum discharge voltages have been lowered to provide the greatest protective margins available in high-capacity arresters.

These lower discharge characteristics give you:

- Expanded zones of protection at arrester installations . . . this may result in fewer arresters at large stations.
- Economies in selection of arresters because new LVS characteristics are below those of previous station-type arresters.
- The possibility of using 100% arresters to protect reduced insulation.
- Reliable protection against direct strokes at unshielded substations because the maximum discharge voltages at 100,000 amperes of lightning are below the BIL of the protected equipment.
- Simpler surge protection on the unit-type generation system.

Westinghouse SV and LVS arresters have 60-cycle spark-overs not less than 1.8 times the arrester rating. This relatively high 60-cycle spark-over increases the margin of safety against damage to the arrester from abnormal voltage conditions such as switching large capacitor banks.

These are the facts . . . facts that make Westinghouse lightning arresters today's greatest protection value.

ARRESTER PERFORMANCE CHARACTERISTICS

Rating KV RMS	Min 60 ~ Spark-over RMS	Maximum Discharge Voltages, KV Crest				
		1500	5000	10,000	20,000	100,000
SV Arrester						
30	60	73	85	93	100	125
73	140	178	206	225	245	305
195	350	475	550	595	645	810
LVS Arrester						
30	60	86	101	112	124	
73	130	220	262	290	320	

FACT:

Sealed deep-drawn steel case with internally mounted bushings is shown here by R. R. Kelley, Instrument Transformer Engineering.

New potential transformers are hermetically sealed for top performance and long life

Furnishing current for metering and relaying control circuits is a function vital to your over-all substation performance.

That's why Westinghouse hermetically seals the new, 2400-volt PT and PTO transformers—to assure you an absolutely reliable source of control current, regardless of length of service or weather.

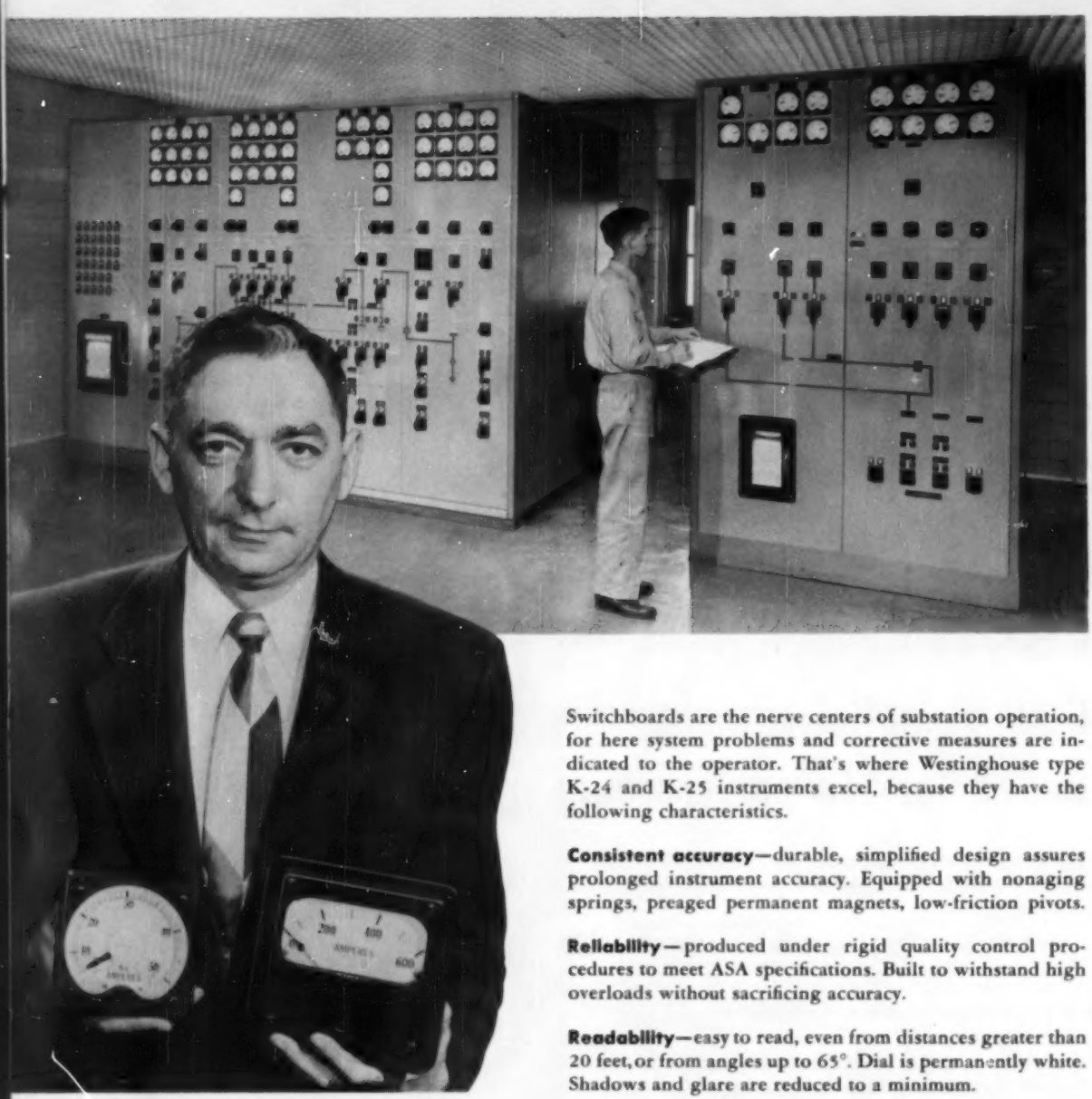
Here's how hermetic sealing is achieved: First, the PT-PTO designs use deep-drawn steel cases with internally mounted bushings and welded bases. Second, the core-coil assembly is vacuum-impregnated and filled with plastic, a process pioneered by Westinghouse.

The results are what you'd expect: Moisture and air completely excluded—no possibility of internal corona—uniform characteristics for the life of the units. A truly reliable, trouble-free control source under any weather or temperature extreme.

For dependability that includes long life and practically no maintenance, specify Westinghouse PT and PTO potential transformers for your substations.

YOU CAN BE SURE...IF IT'S Westinghouse

FACT:
Consistently accurate instruments guard switchboard dependability



Dependable type K-24 and K-25 instruments are displayed by A. J. Petzinger, Manager, Instrument Engineering, another of the product experts who back up The Man With The Facts.

Switchboards are the nerve centers of substation operation, for here system problems and corrective measures are indicated to the operator. That's where Westinghouse type K-24 and K-25 instruments excel, because they have the following characteristics.

Consistent accuracy—durable, simplified design assures prolonged instrument accuracy. Equipped with nonaging springs, preaged permanent magnets, low-friction pivots.

Reliability—produced under rigid quality control procedures to meet ASA specifications. Built to withstand high overloads without sacrificing accuracy.

Readability—easy to read, even from distances greater than 20 feet, or from angles up to 65°. Dial is permanently white. Shadows and glare are reduced to a minimum.

Be sure to specify Westinghouse switchboard instruments for your substations. Selection is complete . . . gives you coordinated styling or match-up for every condition.

J. W. Carr, Relay Specialist, shows the HZ-4 relay designed to help your system provide dependable, uninterrupted service.

FACT:

High-speed, precision relays safeguard your system

Westinghouse HZ-4 relays are fundamentally simple in operation and inherently fast. These single-phase, three-zone, distance-type relays clear faults in less than 0.05 second, give three advantages to a power system:

System can handle larger amounts of power because stability limits of system are raised.

Fault spreading is minimized so that possibility of damage to equipment is reduced.

Faster reclosing gives increased continuity of service.

HZ-4 relays protect the line from damage due to phase faults, and are particularly suitable for applications on heavily loaded lines. A variable offset eliminates the possibility of "undesirable trip-outs". They also provide back-up protection for adjoining line sections.

For the best in relays, rely on Westinghouse leadership in relay engineering.

YOU CAN BE SURE...IF IT'S Westinghouse

B. I. Hayford, Mgr., Metal-Clad Switchgear Engineering, with an array of Redarta components now providing Westinghouse metal-clad switchgear with the industry's most effective insulation.

FACT:

Highest protection standards achieved for metal-clad switchgear

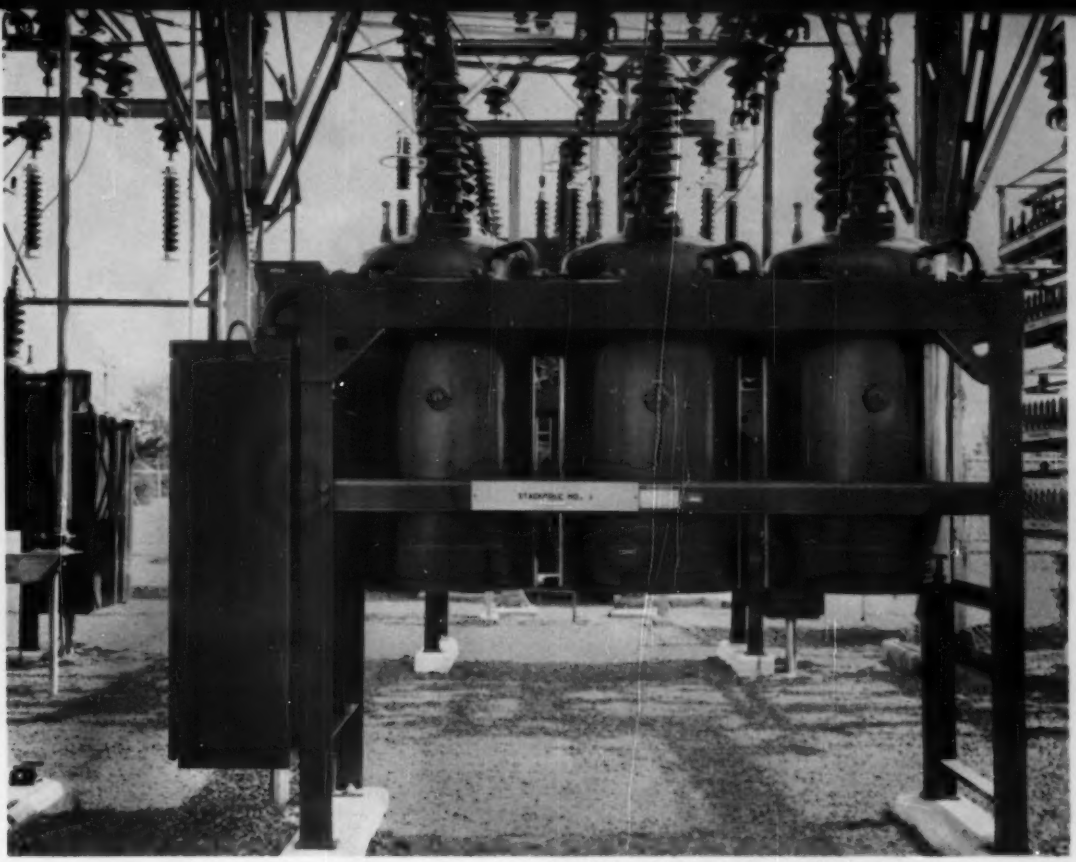
Flame-retardant Redarta . . . from bus through arc chute to disconnect bushing, new Westinghouse Redarta has proved the most versatile metal-clad switchgear insulation obtainable. Laboratory tests prove Redarta slower to ignite and rapidly self-extinguishing, thus preventing fire from spreading to adjacent compartments. Mechanically, Redarta is stronger than all other fibrous insulating materials used for high-voltage applications. Fire-retardant Redarta has been established through exhaustive experimentation and testing as the best all-around insulation for metal-clad switchgear.

Westinghouse exclusive De-ion® arc quenching—arcs are driven swiftly into arc chutes, de-ionized and extinguished. This means less contact burning, less chute wear, longer breaker life.

Bonderizing—five-dip treatment provides a rust- and corrosion-resistant finish, and furnishes a perfect base for painting.

There's more to the story—get your facts from The Man With The Facts, your Westinghouse sales engineer.

YOU CAN BE SURE...IF IT'S Westinghouse



New Westinghouse type G breakers at West Penn Power Co., St. Mary's Carbon Center substation.

FACT:

Four major features make new type G breakers best performers available

The new streamlined Westinghouse line of type G, frame-mounted circuit breakers, 14.4 through 69 kv, retains these 4 major features, proved in service.

Type AA pneumatic mechanism—exclusive design, completely self-contained . . . provides mechanically and electrically trip-free opening, and ultra-high-speed, shock-free reclosing. Meets requirements of all breakers produced or contemplated today—to 330 kv and beyond.

Type S condenser bushing—the first to meet fully the new ASA industry standards, still retains the successful solder-seal construction. The Westinghouse type S has piled up a unique record of 758,000 bushing years in use with a 99.9834% perfect service record.

De-ion grids—a Westinghouse exclusive, thoroughly proved in many years of service in thousands of breakers.

Interrupting ratings—completely verified in High Power Laboratory tests.

A. W. Hill, Mgr., Power Circuit Breaker Engineering, discusses type G breaker design details with The Man With The Facts.

FACT:
Coastal Finish doubles paint protection of power transformers

Coastal Finish—the exclusive Westinghouse mica-base paint system that doubles distribution transformer paint life—is now the standard finish on all Westinghouse power transformers.

Originally developed for the severe atmospheric conditions of seacoast areas, Coastal Finish is an all-purpose coating with unequaled durability under all service conditions. It withstands moisture, oxygen, acids, alkalies and ultra-violet light—will not flake or crack under action of temperature extremes—has excellent coverage on sharp edges. Tests under severe atmospheric conditions prove that Coastal Finish lasts twice as long as other power transformer finishes.

Power transformer tanks are first cleaned by shot blasting, then prime-coated with a zinc-chromate, iron-oxide primer. Coastal Intermediate (mica flakes in modified phenolic and alkyd resins) is then flowed on, followed, in like manner, by a high-gloss ASA-24 gray finish paint. Prior to shipment, transformers are completely spray-coated with the finish material. This provides a durable film thickness of three mils or better.

So protected, Westinghouse power transformers bring to your substations a degree of corrosion protection never before available. This contributes not only to over-all station dependability, but to substantially lower maintenance costs.

WEATHERING TESTS PROVE THE ALL-AROUND SUPERIORITY OF COASTAL FINISH OVER STANDARD FINISH

Finish	Salt Spray 1000 Hours	Acid Resistance 0.5% HCl . . H_2SO_4	Alkali Resistance 0.5% NaOH	Weatherometer 6 Weeks
Standard 100°C	Rusting around identifying numerals	No apparent change after 250 cycles	No apparent change after 250 cycles	No apparent change
Standard 150°C	Heavy rusting around numerals and at edges of panels	No apparent change after 250 cycles	Two top coats eaten away exposing primer after 250 cycles	Fading but no corrosion
Standard 200°C	Panel 50% rusted and peeling	Completely stripped off and rusted after 126 cycles	Completely stripped after 24 cycles	Badly faded with heavy chalking. Edge corrosion
Coastal 100°C	No evidence of corrosion	No apparent change after 250 cycles	No apparent change after 250 cycles	No apparent change
Coastal 150°C	Very faint rusting around numerals	No apparent change after 250 cycles	Faded but film intact. No corrosion	Fading but no corrosion
Coastal 200°C	Very slight numeral and edge corrosion	Faded appreciably but film intact and no corrosion	Finish coat eaten away after 120 cycles. Intermediate coat apparently untouched after 250 cycles	Badly faded with heavy chalking. No corrosion

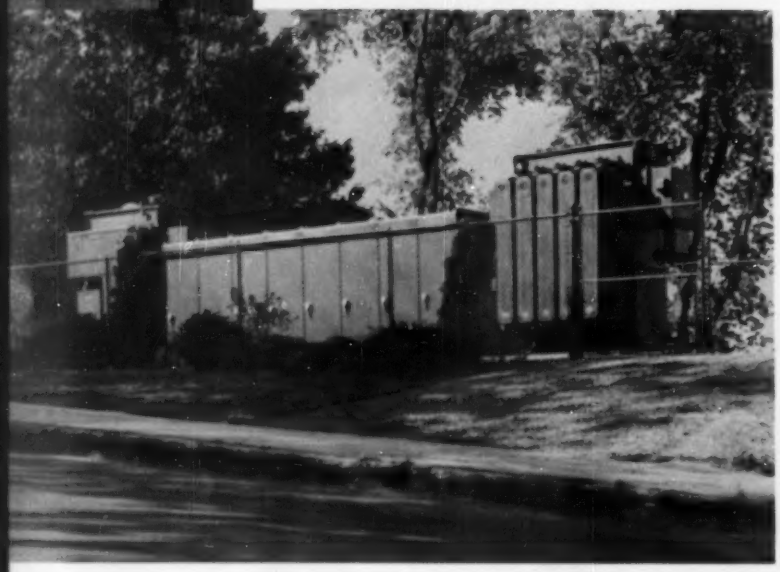
Note: 100°C, 150°C and 200°C indicate that panels were aged one week at these temperatures before making above tests. One cycle in acid and alkali tests consists of 2 hours' immersion and 2 hours' air exposure.

YOU CAN BE SURE...IF IT'S Westinghouse

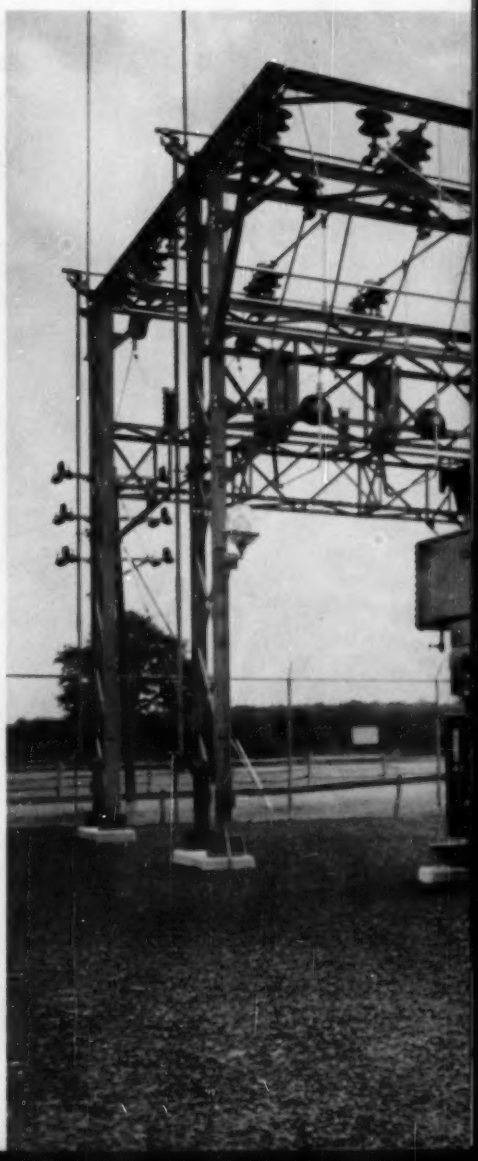
John Cross, Manager of Power Equipment Sales, discusses the application of Coastal Finish to power transformers.

FACT:

Coordination of equipment in unit substations provides maximum reliability of power supply



4,000-kva spot network substation with in-line single bus. Note compact, attractive appearance.



Westinghouse unit substation recently installed at Hartford Electric Light Company.

YOU CAN BE SURE...IF IT'S

Westinghouse

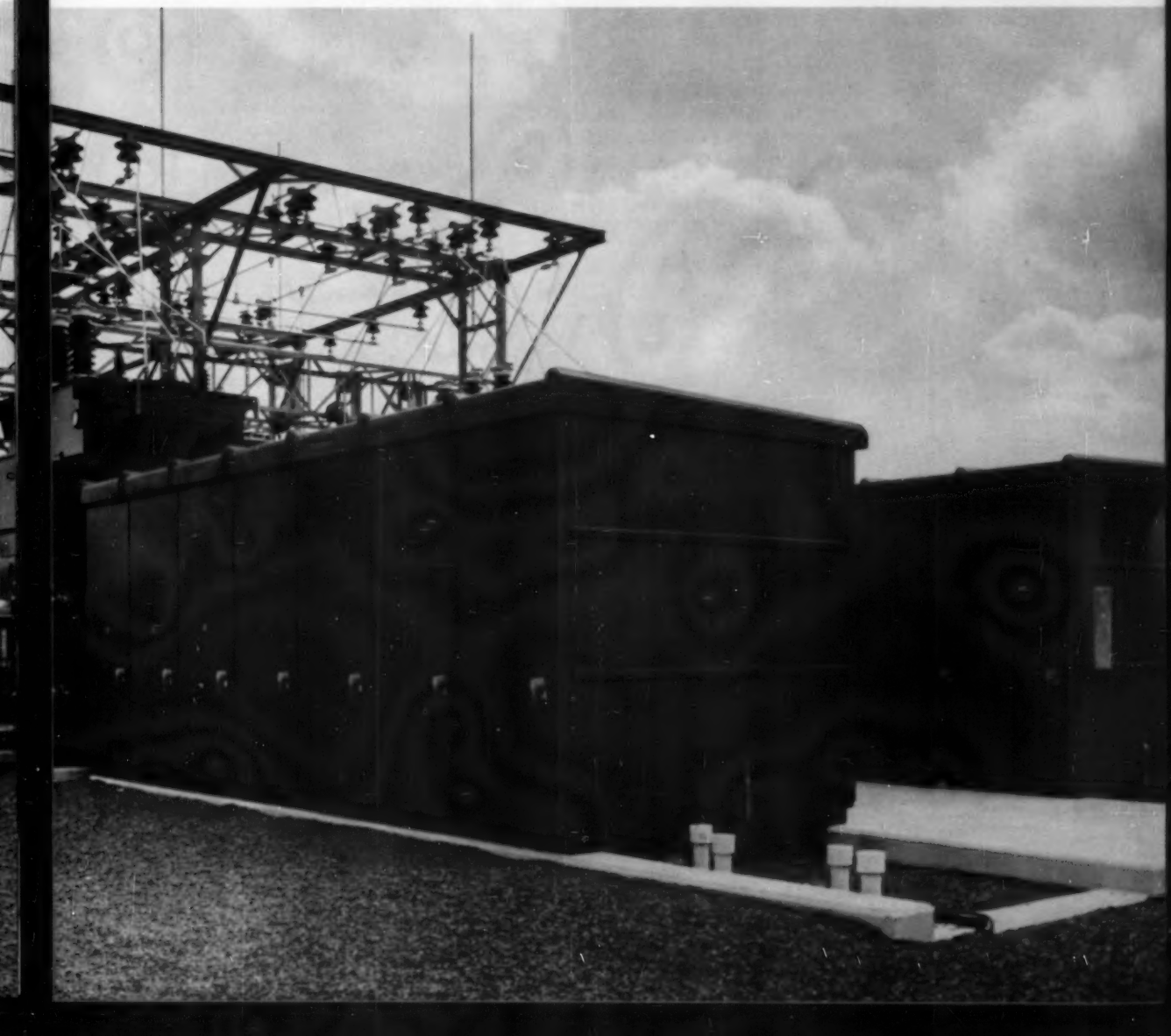
The ultimate in distribution substation dependability is the Westinghouse unit substation. Here's why:

Equipment components that transform, regulate, relay, switch and protect are coordinated—engineered to fit and work together . . . from design through installation.

Products are assembled to give you, in a compact unit, the most dependable operating arrangement, with controls located to provide rapid access. Automatic control for tap changers, for instance, is housed in a cabinet mounted at convenient height on the side of the transformer.

All basic components, built to do a coordinated job, have proved reliable in long service. DH air circuit breakers, for example, employing the principle of De-ion arc quenching, have effectively lengthened breaker life, reduced failures and maintenance to a minimum.

Responsibility for design, engineering, manufacturing and installation resides with one organization of long experience. Complete reliability is the result of not one but all these factors in Westinghouse unit substations.



From specification to substation, Westinghouse engineering helps you achieve dependability

Regardless of the type of substation you plan to build, Westinghouse offers you an unequaled depth of engineering talent to assist you every step of the way:

Product Design Engineers... to coordinate components of individual pieces of apparatus.

Utility Industry Engineers... to help coordinate all the apparatus used in the station.

Service Engineers... available to help supervise installation and testing.

This talent pool is marshaled to your assistance—teamed with your own engineers and consultants, by your local Westinghouse sales engineer... your prime contact with Westinghouse.

What do you gain from all this? Less engineering and purchasing, faster delivery, easier installation—to name a few obvious advantages. More important, you benefit from a total engineering experience gained in countless substations of every type, rating and complexity—experience that assures you a better, more dependable substation, with a minimum investment of your own time and money.

GET ALL THE FACTS.

Call The Man With The Facts...

YOUR WESTINGHOUSE SALES ENGINEER

YOU CAN BE **SURE**... IF IT'S

Westinghouse

CP-1029

INDUSTRIAL BRIEFS

Latex is cured on the back of 15-ft-wide cotton broadloom carpeting in a 269.5-kw infrared oven at Pierce & Co, Los Angeles. The former 217-kw oven handled material up to 12 ft wide. With the production of wider carpeting, the company expanded the oven superstructure and conveyor system and added a bank of 52.5 kw infrared heat. Louis E. Anderson, Industrial Heating Consultant, Department of Water & Power, Los Angeles.

Butt-welding pipe joints for evaporative condenser and cooling tower coils used in air conditioning and refrigerating machines is now done in seconds at Baltimore Aircoil Co, Inc. Joints are held together at 60 lb pressure during the resistance-heated weld. The resulting joint is of high quality, strength, and durability. They have withstood 1,500 lb hydraulic pressure and severe crush and fatigue tests, have been pounded almost flat by sledge hammers, yet have shown no damage when tested underwater at 300 lb air pressure. I. H. Dixon, Jr, Industrial Engineering Representative, Baltimore Gas & Electric Co, Md.

Heat treating light aluminum is now done in an 88-kw radiant oven at Leonard's Metal Forming Co in St. Charles, Mo. Fabricated of aluminum alloys, the metal aircraft parts emerge with a better quality because of the close heat control which can be maintained in the electric oven. The company formerly had trouble attaining an even temperature throughout the baking chamber with a fuel-fired oven. This has been eliminated by the electric installation, and lower operating costs enable the company to save money. Robert Enkelmann, Industrial Engineer, Union Electric Co of Missouri, St. Louis.

Heating asphalt and road oil in the first all-electric plant in the Pacific Northwest is now done at Bremerton, Wash., by the Ace Paving Co, which has substituted electricity for fuel-oil heat. Formerly, electricity was used only to hold asphalt at the correct temperature after it had first been heated with fuel oil. Advantages cited for all-electric heating: automatic operation, requirement of less weather protection for equipment, simplified maintenance, and elimination of a fireman. Total load is 90 kw.

get those

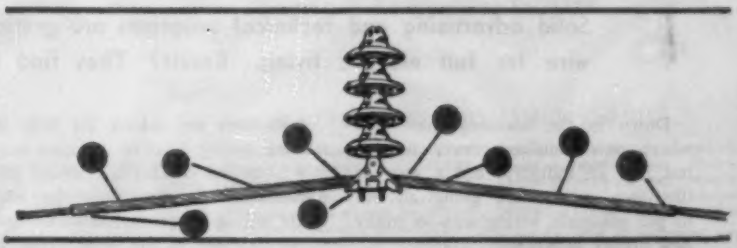
EXTRA FEATURES

in fine FANNER

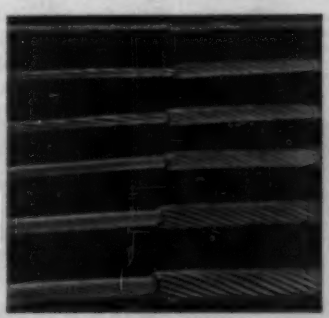
Superformed ARMOR RODS

Their *VERSATILITY* means ECONOMY plus these *ADVANTAGES* (and more!):

1. Conductor protection against harmful effects of vibration.
2. Ends chafing and pitting of conductor by loose line components.
3. Elimination of damage to conductor in case of power arcs.
4. Conductor strength and conductance restored where damaged.
5. Benefits from smaller and closer fitting clamps.
6. Complete reusability — time after time.
7. Permanent "self-clamping" action for life of the application.
8. Facilitated hot-stick application when necessary.
9. Conductance of armor comparable to that of conductor.



• High standards in design and production of FANNER SUPERFORMED ARMOR RODS based on over 50 years of manufacturing provide unvarying uniformity of application and service. Consult our agents or write direct for additional information on Superformed Armor Rods, Line Guards, Top Armor and Patch Rods.



Fine Fanner Superformed

Licensed for use under Patent No. 2,275,819

THE FANNER MANUFACTURING CO.
Brookside Park • Established 1894 • Cleveland 9, Ohio
AGENTS IN PRINCIPAL CITIES

With a variety of promotional assists like this, Tulsa and Houston show . . .

How to Get Builders on Your Side

Solid advertising and technical programs are getting merchant builders to wire for full electric living. Result? They find their homes sell better

Down in the booming Southwest where new building construction is not just an industry, but a way of life, two utilities are going all out to get adequate wiring into as many new homes as possible.

Directing their fire principally at the merchant builder, Public Service Co of Oklahoma and Houston Lighting & Power Co have developed programs that thus far have delivered highly gratifying results. The companies feel they've found a workable solution to the AW problem and, to top it off, home builders are discovering that adequately wired homes sell faster.

Here's what is happening in Tulsa, where the Public Service program is in full force

- Prospects are starting to ask about a home's wiring before they buy.
- Range outlets are getting universal acceptance. Many people insist on them.
- Built-in electric ranges are being promoted with the wiring job.
- Builders are asking for help in making wiring layouts.
- Electrical contractors, union and non-union, are supporting the adequate wiring program 100%.

An example of the progress being made is the changed attitude of one home building firm. From 1952 to 1954 it built 235 homes with an average panel size of six circuits. Late in 1954 it started a project of 470 homes, this time with an average panel size of 16 circuits. The homes are all in the same general area and the same size—1,000 sq ft. It costs the builder more to do it, but he admits it helps to sell the public.

Public Service is happy too. In a comparison it made between two adjacent housing developments—one adequately wired, the other not—it found customers in homes with full wiring used 38% more kilowatt-hours.

Utility and NAWB Both Help . . . To woo the builder, the company and the Tulsa chapter of the National Adequate Wiring Bureau provide both promotional and technical helps. The bureau makes free wiring layouts upon request for builders and prospective home buyers. So far one man has handled this work, but so many requests have been coming in that additional help appears necessary. A promotional allowance of $25 per home is made to the builder if wiring includes a range outlet and a service entrance of No. 4 min size. All of these tactics have proved effective.

But the company doesn't end there. It goes directly to the public through newspaper ads, one-min TV spots, and illustrated talks before civic clubs. A lot of planning goes into these talks. The appliance and circuit needs for each room in the house are explained. Reasons for heavier copper requirements and the importance of proper fusing are covered.

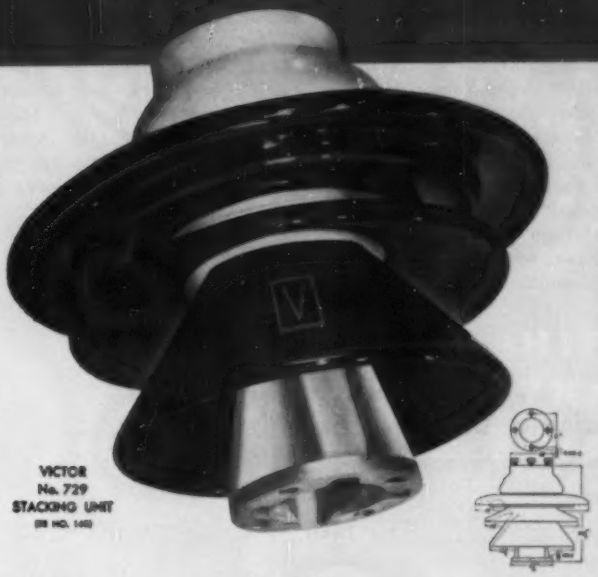
Newspapers and Tulsa city officials have generously supported the program. As part of the promotion, even

(*Continued on page* 170)

No Finer Apparatus Insulator!

It's VICTOR . . .

made of Purified Porcelain . . .



VICTOR
No. 729
STACKING UNIT
(IR NO. 1402)

With VICTOR "Know-How"

Correct design, quality-controlled manufacture, accurate jig assembly and *Purified* Porcelain make VICTOR Apparatus Insulators supreme in their field. These insulators give power men complete assurance because they combine maximum dielectric and mechanical strength. Each VICTOR Apparatus Insulator is individually tested at every point of manufacture. Each has to be precision-perfect before it is shipped. That's why these units are easier to install singly or in stacks, why they stand up better in service . . . why more and more power men are specifying VICTOR.

FEATURES

1. **MAXIMUM MECHANICAL STRENGTH** guarantees on-the-job dependability.
2. **PRECISION ASSEMBLY** assures perfect alignment . . . greatest possible stacking ease.
3. **MADE OF PURIFIED PORCELAIN** each insulator has unequaled uniformity of mechanical and electrical values, and resistance to thermal variations.
4. **THICK, RUGGED CORRUGATIONS** afford maximum resistance to impact . . . cut breakage costs.
5. **SCIENTIFICALLY COMPOUNDED CEMENT** assures high bond strength at all assembly joints.
6. **CAPS AND BASES** are hot-dipped galvanized for maximum resistance to weathering and corrosion . . . are engineered to exceed NEMA specifications.
7. **SMOOTH, HARD GLAZE** assists self-cleaning process, reduces maintenance and replacement costs.
8. **RESILIENT COATINGS** at all cemented joints give maximum resistance to thermal variations and mechanical shocks or impact.

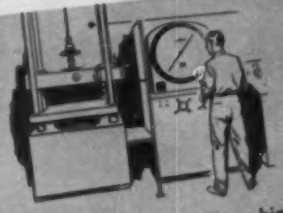
SPECIFICATIONS (SINGLE UNIT)

60 cycle dry flashover	160 KV
60 cycle wet flashover	95 KV
Pos. impulse flashover*	235 KV
Neg. impulse flashover*	290 KV
Withstand voltage 60 cycle dry	115 KV
Withstand voltage 60 cycle wet	75 KV
Withstand impulse voltage*	210 KV
Puncture	215 KV
Dry arcing distance	14⅝"
Leakage distance	33"
Tension strength	20,000 lbs.
Torsion strength	40,000 lbs.
Compression strength	60,000 lbs.
Cantilever strength base std.	7000 lbs.
Cantilever strength cap std.	4000 lbs.
RIN	100 microvolts
1000 KC at applied	22 KV

*Crest KV. 1½ x 40 microsecond wave critical values.

For the full facts on Victor "Know-How," write for "The Story of Victor and Purified Porcelain." For engineering data on Victor insulators, write for Bulletin No. 4.

NEWS FROM VICTOR



To take care of expanded test facilities, the Victor high voltage laboratory has been greatly enlarged and a new 120,000 pound Tinius-Olsen hydraulic testing machine (shown in drawing above) installed. This machine exerts a programmed load on a test piece while subjected to high voltage current. Tests are run to destruction either by mechanical or electrical failure.

SPECIFY VICTOR

Purified Porcelain Pintypes

VICTOR INSULATORS DIVISION

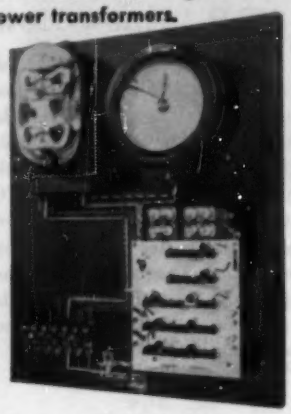
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Cap Strain Insulators • Switch and Bus Insulators • Custom Designed Porcelain Insulator Hardware

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.

Get your book now FREE

Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.

EASTERN SPECIALTY CO.

PHILADELPHIA 40, PA.

"Dealer gives builder a boost, too . . ."

(*Continued from page* 168)

the mayor turned out recently to present the Tulsa chapter with its NAWB charter.

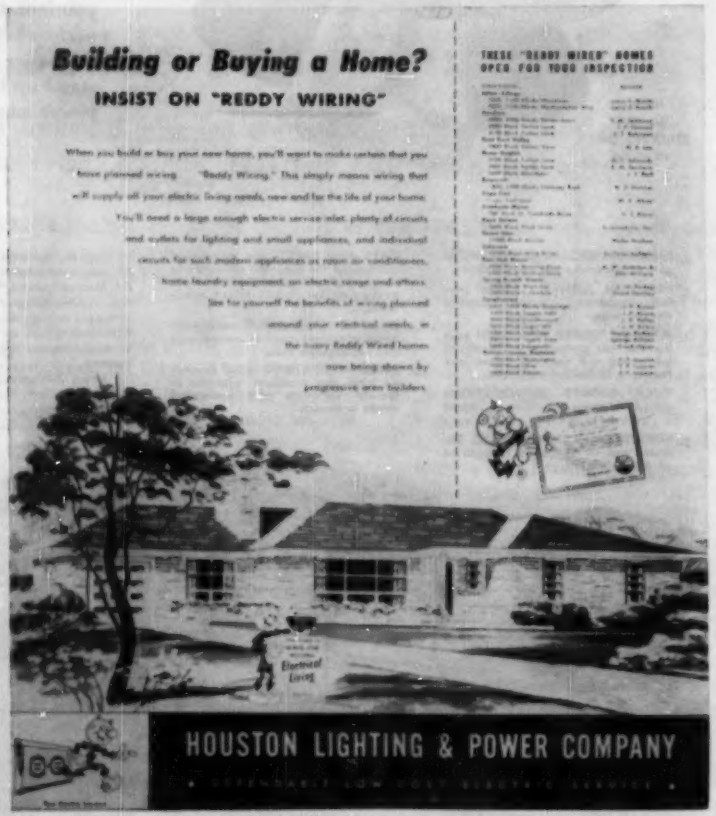
Houston's Wiring Package . . . In its area Houston L&P is pushing a "Reddy Wiring Program" with similar results. Target is not only the new home builder and buyer, but also owners of existing homes.

Cooperating builders are supplied display materials, general advertising support, and Adequate Wiring Certificates for presentation to buyers of their homes. Before the first month of the program was up, AW agreements had been signed for 110 construction starts.

To owners of existing dwellings, the company offers a "Reddy Wiring Package" through local banks and lending agencies with no down payment and 36 months to pay. Package includes service inlet of three No. 2 copper wires and 100 amp switch; enough convenience outlets so there is one for every eight ft of usable wall space; and 230-v circuits for refrigerator, range, washer, dryer, etc.

Another big ally in Houston's campaign is the dealer. He takes part by using displays and promotional material furnished by the utility, drop-in slugs in his newspaper advertising, and by recommending wiring modernization to appliance purchasers. He gives the builder a boost, too, by urging new home prospects to insist on adequate wiring before buying. Thus, reasons Houston L&P, the homeowner with adequate wiring will become a lucrative source of appliance sales as he improves his standard of living, and the dealer stands to profit proportionally.

(*More S & S on page* 172)



HOUSTON'S CONSUMER ADVERTISING lists names of cooperating builders and tells buyers where to find adequately wired homes. Note plug for AW certificate

THE BEST POLES HAVE THEM

MOLONEY ELECTRIC

HIPERCORE TRANSFORMERS

Today's distribution systems require more and more transformers. In areas where air-conditioning is widely used, a transformer for every pole is becoming the planned rule.

The best poles have Moloney HiperCore Transformers to insure continuous, dependable operation of this new system. Because HiperCore Transformers are famed for long, trouble-free operating records ... meriting the phrase ... Dependability at its Best.

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

WATCH YOURSELF!

(Everyone else does)

USE DIAMOND UtiliVue

INDUSTRIAL TELEVISION SYSTEM

Everyone can see those tall chimneys that carry off gases or fumes from your plant. Many of these people will judge unfairly . . . will blame you for everything from smog to tattle-tale grey wash . . . even though there is smoke for only a few minutes a day.

The "UtiliVue" (wired television) will bring a sharp picture of the stacks to the control panel or any other convenient point. The operator SEES the smoke exactly as do people on the outside and takes corrective action at once. Chimney smoke is only one of many things that the "UtiliVue" can watch to your profit and advantage . . . in fact, anything that is too remote, too hot, or too dangerous to observe directly. Get in touch with your Graybar Distributor or use the coupon below for informative booklet.

UtiliVue Camera

Monitor

7119

Distributed by GraybaR ELECTRIC COMPANY

DIAMOND POWER SPECIALTY CORP.

LANCASTER OHIO

DIAMOND POWER SPECIALTY CORP.
ELECTRONICS DEPT., P.O. BOX 415Q,
LANCASTER, OHIO

Please send me without obligation a copy of new bulletin showing how Diamond Industrial (Wired) Television will help me reduce costs, improve quality, increase sales and aid safety.

Name_____

Title_____

Company_____

Address_____

S & S SHORTS

"Package" Wiring Extended

Minneapolis and St. Paul's Twin City "Package" plan for residential re-wiring (EW, Jan. 24, p 202) has been extended for another 13-week period. Success of the plan so far, say members of the plan's sponsoring committee, stem from two "motivating" factors: 1-the free wiring survey offered home owners; 2-convenient payment terms. Committee is now working with city officials to make 100-amp service entrance a requirement in new home construction.

PELCo Show Sells Commercial Wares

At least 14 different pieces of commercial cooking equipment were sold during a three-day food service equipment exposition held recently at Patchogue Electric Light Co, Patchogue, N. Y. Some 346 persons turned out to see displays exhibited over more than 4,000 sq ft of floor space by 21 different manufacturers of commercial appliances and cooking wares. A local restaurant supply company and Durkee Famous Foods co-sponsored the show.

Is Lighting Like Plumbing?

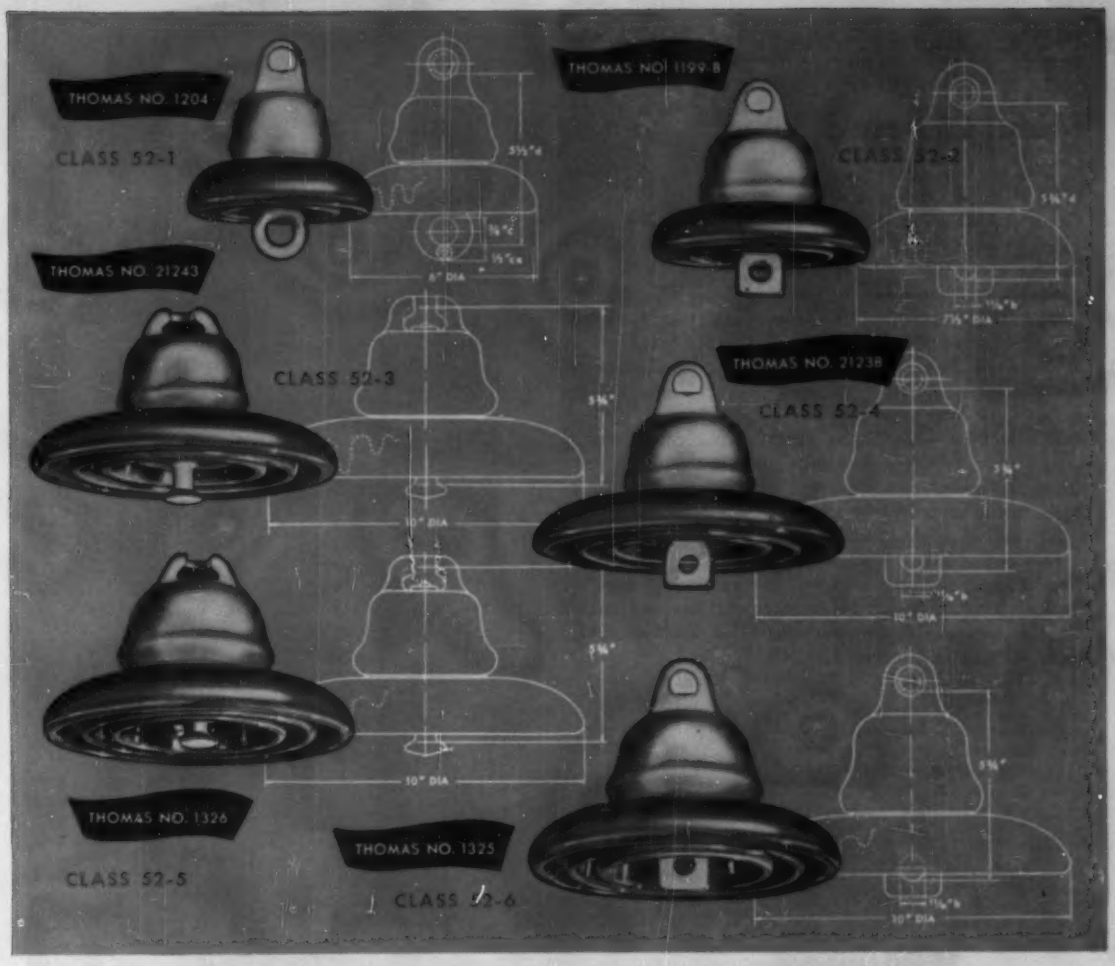
A two-year study aimed at getting architects and builders to treat lighting as a basic part of home design will be conducted by Cornell University's Housing Research Center under a grant from Lightolier Corp, lighting fixture manufacturers. Study first will formulate basic requirements for good home lighting, and then investigate engineering and design.

Indianapolis Goes After Heating

An electric space heating division has been set up by the Electric League of Indianapolis, after more than 30 persons attended a recent organization meeting. Division already has sponsored a six-week space heating training course for contractors.

Shorties:

A General Electric Co vice president, Chester H. Lang, said recently that electricity will figure prominently in the heating of homes within the next five years. . . Georgia Power Co has been advertising free home instruction to all its customers who buy a leading brand of automatic ironer.



THOMAS EEI-NEMA STANDARDS

Two of the strongest arguments for standardization are stock simplification and the advantages of interchangeability. Although we catalog many different designs, we are 100% in support of any standardization that we believe helps the industry. Therefore, we suggest users specify EEI-NEMA Standards for their suspension insulator requirements.

Thomas insulators are backed by 82 years of ceramic experience and knowledge. Quality material, precision manufacturing and PROOF OF PERFORMANCE make Thomas porcelain the standard of comparison for discriminating engineers throughout the Electrical Industry.

In 1907, Thomas designed and made the first cap-and-pin suspension insulator. Units installed that year are still giving trouble-proof service after 48 years of continuous operation.

Specify Thomas EEI-NEMA Suspension Insulators with full confidence that their quality and value cannot be surpassed.

The R. Thomas and Sons Co.

LISBON, OHIO

1873 THOMAS INSULATORS our 82nd year EEI-NEMA 1955

NEW EQUIPMENT

Metal-Enclosed Switchgear

Metal-enclosed, 600-v switchgear line features circuit breakers rated 600 amp with 25,000 amp interrupting capacity (LA-25), and 1,600 amp with 50,000 amp interrupting capacity (LA-50). Line is available in indoor and outdoor arrangements.

Reversible panels mounted on each breaker compartment permit doors to be closed with breakers in connected, test or disconnected position. Each breaker compartment is barriered from bus compartments independently of breaker frame and from adjoining breaker compartments by a double steel wall.

Bus in each individual switchgear unit consists of a set of vertical risers braced with strain insulators to withstand mechanical forces exerted by short circuit current. Main bus is supported by these risers. Additional bracing is provided by strain insulators between phases.

Outdoor unit has a weatherproof housing and a wide unobstructed aisle between exterior panel and front of breaker compartments. An overhead rail-mounted circuit breaker handling device is available as optional equipment. Details in Bulletin 18B8283.

Allis-Chalmers Mfg Co, Milwaukee 1, Wisc.

Instrument Transformer Test Table

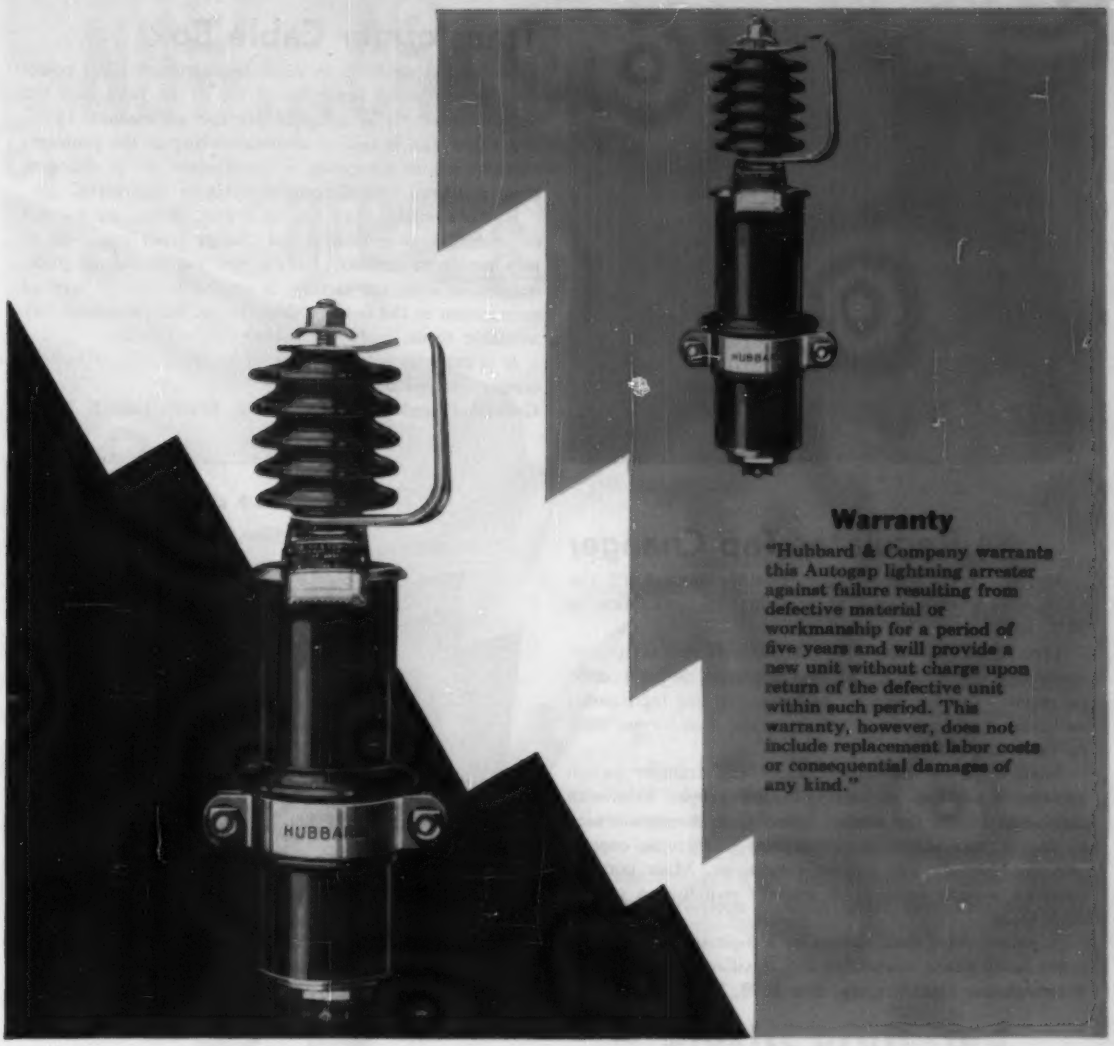
Test table provides heavy current for (leading) current transformers and facilities for testing potential transformers. Called Form "CTT," the table is made in 6,000 and 2,500 amp capacities.

Control table is equipped with a multi-tapped auto-wound transformer and an induction type regulator mounted in a cabinet on the top. A loading transformer and diamond shaped contactor (to hold standard transformer and transformer under test) are mounted on a separate dolly.

Output of loading transformer is controlled by changing the applied voltage. Coarse adjustment is obtained by connecting primary of loading transformer to different taps of auto transformer which has its full winding connected across the source of supply. To obtain closer adjustment of current at very low voltages, a small induction regulator is furnished to bridge the auto-transformer taps. This arrangement permits continuous adjustment of output current from zero to full capacity.

Copper links for connecting 6 or 21-v transformer taps are rated for the full 6,000 amp.

States Co, 19 New Park Ave, Hartford, Conn.



Warranty

"Hubbard & Company warrants this Autogap lightning arrester against failure resulting from defective material or workmanship for a period of five years and will provide a new unit without charge upon return of the defective unit within such period. This warranty, however, does not include replacement labor costs or consequential damages of any kind."

Now warranted for 5 years

The Hubbard Autogap Lightning Arrester

Since their introduction 15 years ago, Hubbard Autogaps have established remarkable performance records in every state, under every type of weather and storm.

On the basis of this outstanding service record . . . unapproached by any other lightning arrester . . . Hubbard now offers a 5 year warranty with every Autogap sold. Details of this offer are outlined in the insert shown above.

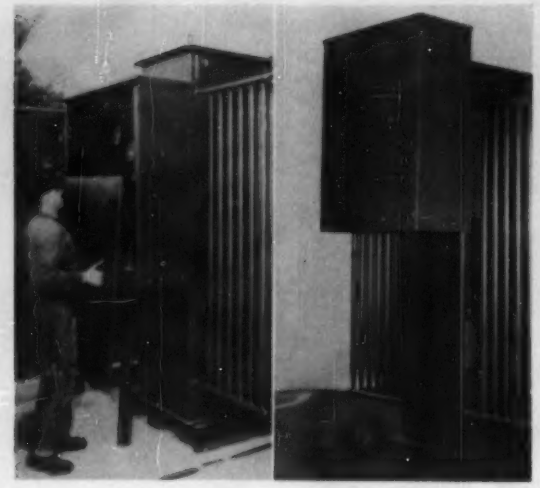
This warranty is possible because of the efficient design of Hubbard Autogaps. The exclusive dual exhaust dissipates extreme pressures harmlessly and quickly. And, the Hubbard Autogap permits surges to be discharged over an infinite number of paths along a cylindrical barrier plug . . . thus preventing the burning and consequent loss of efficiency caused by the usual method in which the discharge follows the *same* path each time the arrester operates.

Impartial tests, conducted by utilities as well as by an independent research laboratory, have proved Autogaps to be superior to any other lightning arrester on the market.

If you're not already among the many who have Hubbard Autogaps in service, call a Hubbard distributor or Hubbard representative and investigate the real economies and protection you too can get with the Hubbard Autogap.

HUBBARD AND COMPANY

Pittsburgh 1, Pa.
Chicago 50, Ill.
Oakland 8, Cal.



Transformer Cable Box

Reversible, air-filled terminal compartment gives power transformers more flexibility of use in the field, says the manufacturer. It is designed for use on circuits 15 kv and below and is said to eliminate many of the problems encountered in relocating a transformer or in changing from overhead to underground cable or vice versa.

Box is available with wiping sleeves, drilled for conduit or undrilled, to permit a fast change from one type of termination to another. Only a new top or bottom plate, obtainable from the factory, is needed to change type of termination in the field. Compartment accommodates any available cable, including rubber-covered cable.

It is completely weather-proof in either top or bottom connected position.

General Electric Co, 1 River Rd, Schenectady 5, N. Y.

Regulator Tap Changer

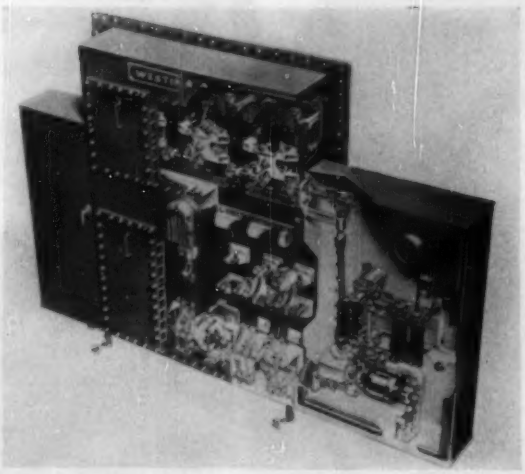
Mechanism for step voltage regulators above 1,500 kva changes taps under load to provide 10% regulation in ⅝% steps.

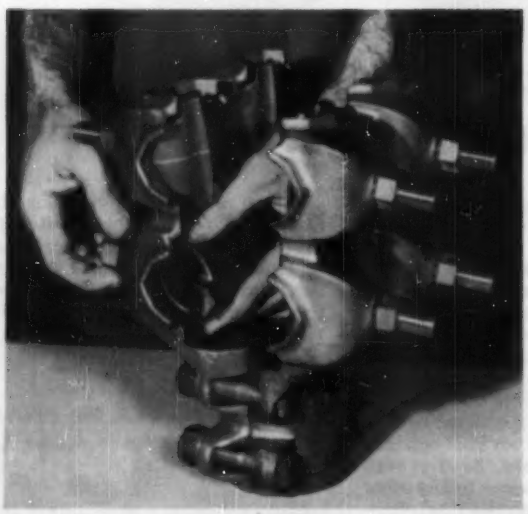
Type URT tap changer is completely self-contained. Switching equipment is in two separate oil-filled compartments—one for selector switches, and one for transfer switches. They are separated from the transformer tank by insulating barriers.

Selector switch moving contacts and transfer switch stationary contacts are spring-loaded copper bars with coin silver inserts for contact areas. Iron channels brazed to copper bars act as electromagnets to increase contact pressure during fault current conditions. Main current-carrying moving contact on transfer switch is a copper alloy blade.

A geared drive shaft driven by a 3-phase, 220-v motor operates all phase assemblies and auxiliary cam switches.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.





Stud Connector

Stud connectors for use with large power transformers are designed to prevent later replacement due to re-conductoring.

Connector is built for connecting 4 conductors from 500 Mcm to 2,000 Mcm in a vertical or horizontal plane to a 3-in. threaded bushing stud. The eight high-tensile eyebolt clamping members (2 per cable) can be tightened on cables in a vertical take-off position or they can each be rotated 90 deg to clamp horizontally. Four clamping bolts are provided in the base.

Anderson Brass Works, Inc, 700 N. 41st St, Birmingham, Ala.

NOW...Chance Pike Poles are laminated!

No other Pikes can compare in . . . Quality . . . Durability . . . Safety

for greater uniformity ...greater rigidity

Made just like a Hot Stick!

Now . . . Chance Pike Poles are made the same way famed Chance Hot Sticks are made . . . by lamination . . . by bonding together carefully selected Douglas fir boards.

Laminated pike poles have many advantages over the old, single board pike poles. They're more rigid. They're more uniform . . . every Chance *laminated* Pike Pole has the same high quality built into it. (Quality is hard to control in single board poles.) Best of all, a *laminated* pike pole is safer. It resists dangerous splitting because the grain of the laminated pieces runs in different directions . . . each board reinforces the other.

STANDARD PIKE

SAFETY PIKE

Point can be reversed, as shown in circle, for safety in handling and transporting between jobs. When point becomes badly worn, a new reversible point is all that is needed—the pole needn't be replaced.

MAPLAC

plastic protected

Chance *laminated* Pike Poles are available with a tough, plastic coating, called "Maplac," that greatly increases their service life and adds to their safety. Splintering of the wood is eliminated. Lost-time hand injuries caused by splinters are avoided.

IT PAYS TO BUY HIGH QUALITY IN A PIKE POLE

Only on a *Chance* Pike Pole will you find the steel reinforced butt which protects the end of the pike. And only *Chance* Pike Poles are available with Maplac protection.

Write for the full story today.

You know it's RIGHT when you specify CHANCE

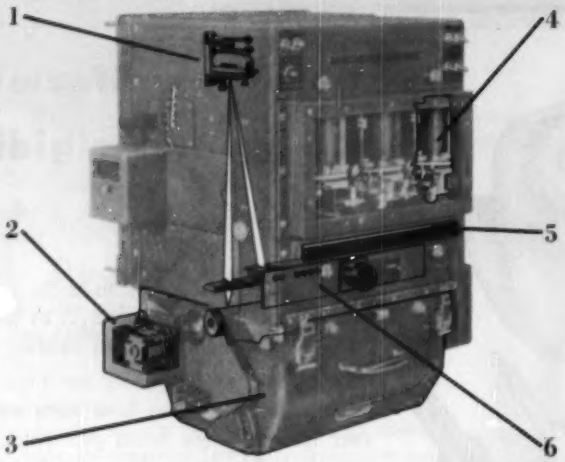
A·B·CHANCE CO.

CT59-1 **CENTRALIA, MISSOURI · SAN FRANCISCO, CALIFORNIA**

ABC INDUSTRIES

EXCLUSIVE FEATURES

Make the Hathaway RS-9 Your Best Automatic Oscillograph Investment



THESE FEATURES, available *only* in the Hathaway RS-9, help make it the power industry's *first choice:*

1. A wide selection of standard galvanometers (including watt galvanometers) that make the RS-9 adaptable to virtually any power generation or distribution recording application.
2. An automatic chart advance mechanism that prevents record fogging.
3. Record magazine construction that makes it possible to check recording beams without exposing the record paper.
4. Advanced design relays that assure dependable high-speed starting.
5. A viewing screen that makes it possible to inspect galvanometer traces conveniently at the front panel.
6. A precise optical system that produces traces of unmatched clarity and sharpness.

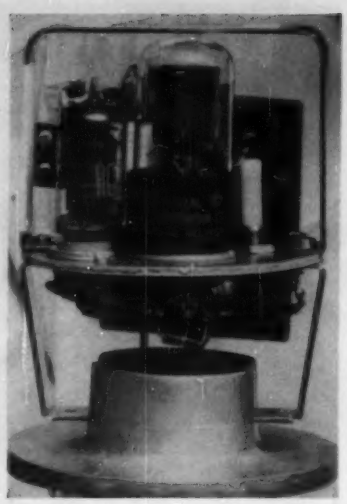
and . . .

The RS-9 has 12 channels—for *complete* station monitoring It produces 10-inch-wide records on which large deflections can be read easily and accurately. RS-9 models are available for 12, 48 or 125 volt D-C operation.

Write for Bulletin 2-FI-B.

Hathaway
INSTRUMENT COMPANY • DIVISION OF
Hamilton
WATCH COMPANY

1315 SOUTH CLARKSON • DENVER, COLORADO



Street Light Control

Single unit, photoelectric lighting control functions beyond normal 105 to 130 v and switches 1,000 w of lighting load. Amplifier tube is said to operate well below rated value. Anticipated life of tube and photocell is from 2 to 5 years.

Unit is provided with a non-breakable, weather-proof polyethylene cover designed to blend into any installation whether mounted on pole, crossarm, or standard. Details in Catalog No. 8110.

American Electric Mfg Corp, Box 5142, Memphis, Tenn.

Telemetering System

Transmitting unit of telemetering system yields its data to receiving operator upon demand or at periodic intervals, thus enabling the same transmission channel to be used for other functions. The unit is a digital type, impulse storage device which operates over any type channel.

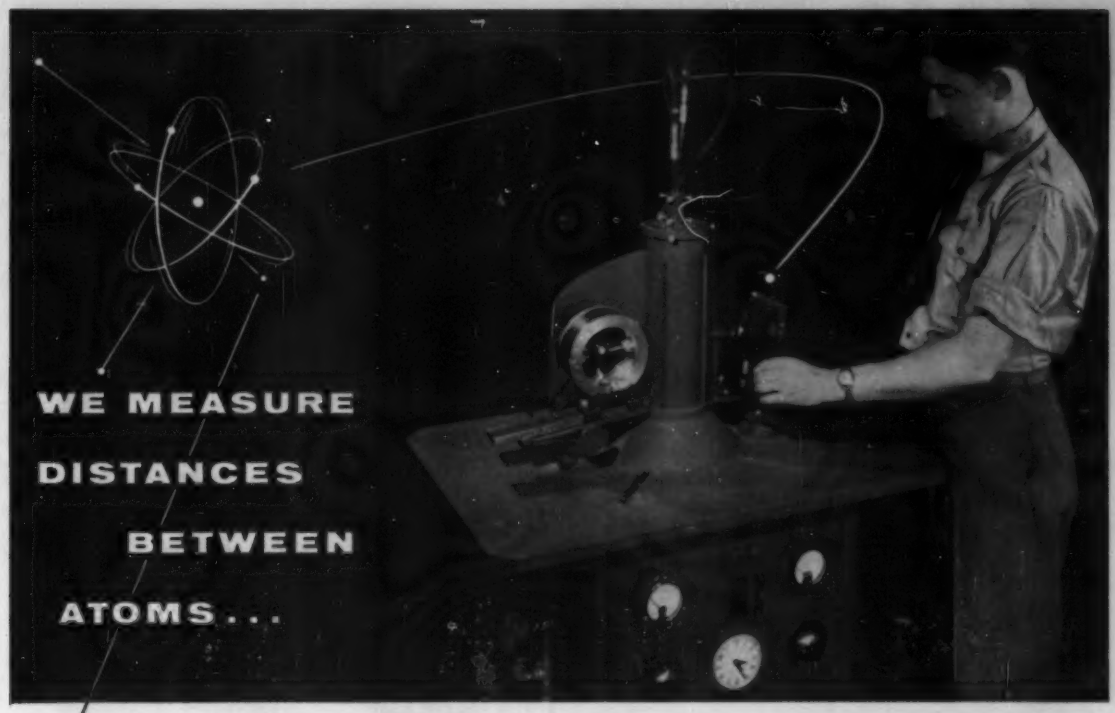
The TM-16 system does not cancel its stored information upon transmission so that if signals are interfered with, the information is available for later transmission.

Signals can be received directly on an indicator which can also operate into a printer for automatic recording.

Units are available for transmission of 3 or 6 digit values. Transmission and indication time is 3 and 6 sec respectively.

Control Corp, 718 Central Ave, Minneapolis 14, Minn.

(*More New Equipment on page* 182)

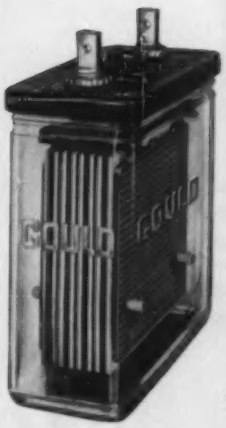


TO GIVE YOU *Advance Design* BATTERIES!

The X-Ray Diffraction Unit shown above is one of the few instruments of its kind being used in basic battery research. It identifies complex metallic compounds which cannot be identified practically by chemical means. It does this by actually indicating on film the distances between atoms, enabling Gould engineers to study atomic structure.

This instrument . . . this research . . . is revealing hitherto unknown facts about the relationship between molecular activity and battery performance . . . pointing the way toward more powerful, longer lasting active materials. That's why you get *better* batteries when you buy Gould!

For the full story on Gould Research, send for Booklet 749.



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

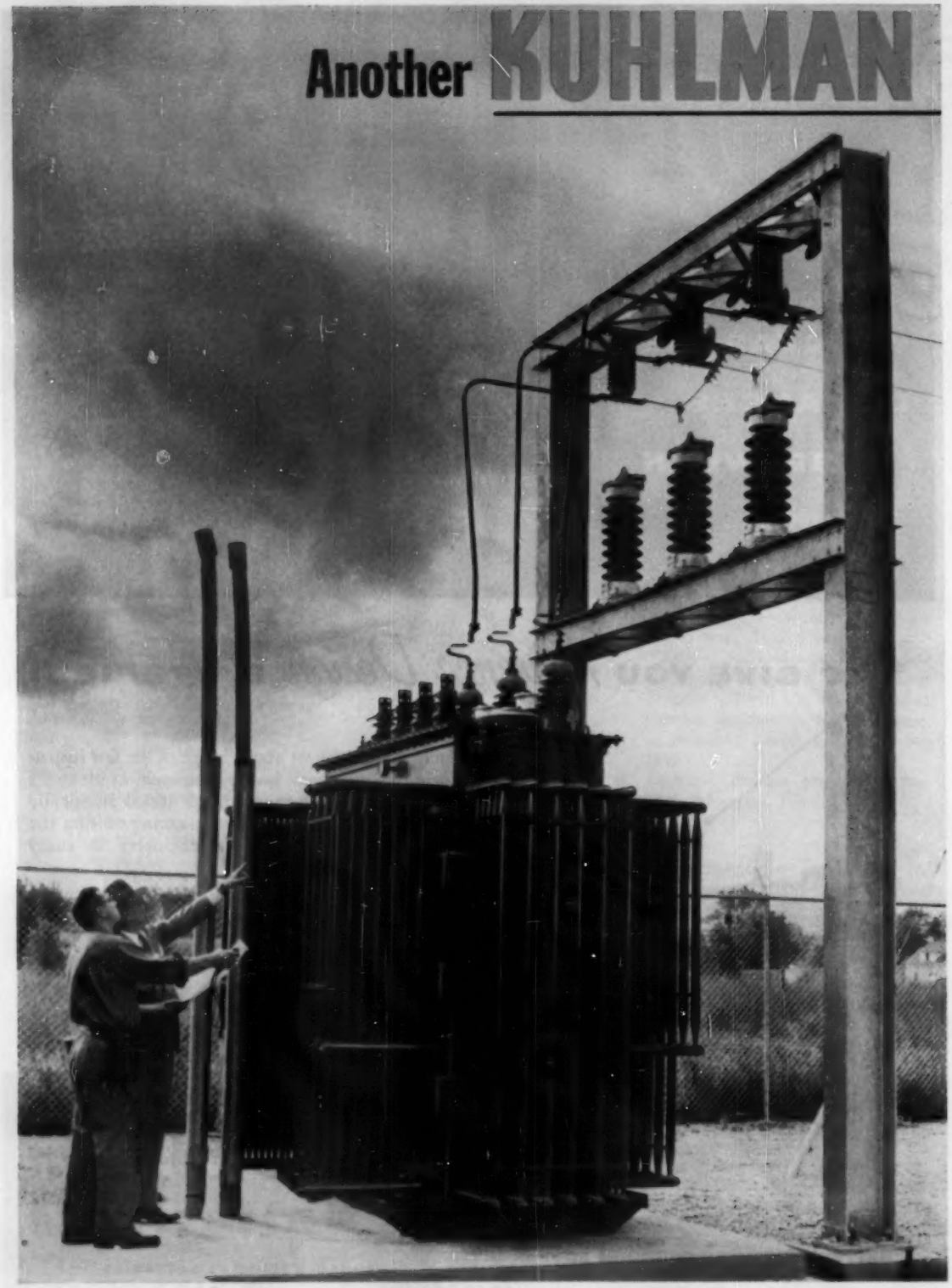
©1955 Gould-National Batteries, Inc.

GOULD
Batteries

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

"BETTER BATTERIES THROUGH RESEARCH"

Always Use Gould-National Automobile and Truck Batteries



KUHLMAN KUHLMAN ELECTRIC COMPANY

power transformer goes into service

After over sixty years of supplying the nation's leading utilities with dependable transformers, Kuhlman still remains exclusively an independent transformer manufacturer. As a result of this specialization, Kuhlman has been able to refine the art of transformer craftsmanship and build a reputation for reliability and quality manufacturing — just one of the many reasons for selecting a Kuhlman Power Transformer.

Today, Kuhlman offers a complete line of small Power Transformers to serve your utility's expanding residential and industrial needs. The photograph at the left, showing a 2500 KVA 3-phase Power Transformer being installed to serve a new mid-west suburb is typical of the preference shown by satisfied Kuhlman customers who consistently reorder Kuhlman Transformers because of the record of their past performance.

Select the Kuhlman Transformer that best suits your requirements and join the many old and new Kuhlman friends who specify Kuhlman Transformers because of these and many other time-tested features.

core and coil

1. All connections inside coil are brazed. Brazed connections used for heavy bus outside the coil.
2. Tap changers of rugged construction give high overload capacity and low temperature rise at contact.
3. Tank anchor pads lock core to tank.
4. Steel clamping rings hold coils solidly in place.

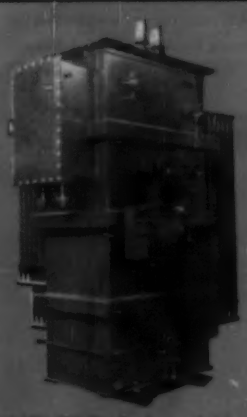
tank

1. Tanks constructed of heavy steel plates meet latest NEMA ASA standards.
2. Seal Tanks minimize deterioration of oil.
3. Transformers can be vacuum filled in the field.
4. Metal steps in cover to assure proper gasket compression.

833 KVA Single phase 34.4 KV

3,333 KVA Single phase 67 KV

5,000 KVA Three phase 67 KV



1,477 KVA Single phase 67 KV

141

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

"FEDNEWS" PHOTO

Let There Be Light-

Sorry — we're out of business today, and for many days. We've been forced to cut "interruptable" customers. Total loss in fire damage and power may exceed 10 million dollars.

Here's what happened. Fire started in a circuit breaker and spread throughout the building. The roof crashed down. Giant steel beams sagged like ribbons. Concrete walls fell into the machinery. Engineers and repair crews are restoring our power output, but it will take time and plenty of money.

Moral: Prevent damage to equipment and interruption of power service with ENGINEERED "Automatic" FIRE PROTECTION. It involves analyses of your needs based on the machinery and equipment connected with your operation. Your hazard may best be protected by means of "Automatic" FIRE-FOG, AIR FOAM, CO_2 or a combination of these extinguishing mediums. The need is dictated by the degree of hazard, the demand for personnel safety, the high value of equipment, the requirements for uninterrupted business operations.

Learn how ENGINEERED "Automatic" FIRE PROTECTION can safeguard your plant — save you dollars while doing it. Mail the coupon for FREE descriptive literature.

"Automatic" Sprinkler Corp. of Amer.
Youngstown, Ohio

Please rush copy of Bulletin 64 — Design and Application of "Automatic" FIRE-FOG

Name_____

Title_____

Company_____

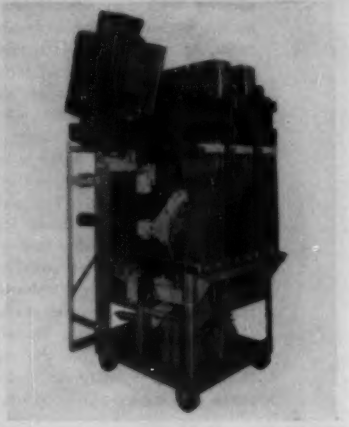
Address_____

City_____ State_____

"Automatic" Sprinkler
CORPORATION OF AMERICA
YOUNGSTOWN, OHIO
Offices in principal cities of North and South America

Drawout Switchgear

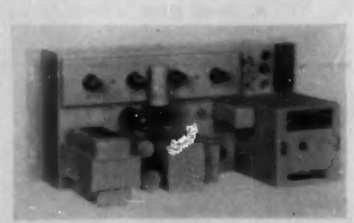
Circuit breaker arrangement permits each interrupter assembly to be tilted back by hand and anchored in inspection position. This feature is said to make normal maintenance easier on 7.2 and 13.8 metal-clad



switchgear with breakers rated up to 2,000 amp (continuous) and 500 Mva interrupting capacity.

With drawout breaker wheeled out of its compartment, a removable arc-chute is attached at the back and a lifting yoke at the front. Inspection position gives full view of interrupter plates within the chute and opens entire contact assembly for examination.

I-T-E Circuit Breaker Co, 19th & Hamilton Sts, Philadelphia 30, Pa.



Telemeter Transmitter

Frequency-type telemeter transmitter electronically converts small dc signals into a 6 or 27 cps frequency for telemetering. The TF-8 is said to be ideal for measurement of station generation, power transmission and tie-line interchange.

The unit can be placed in parallel with high-speed electronic recorders without interaction. This eliminates delay in providing the telemeter signal.

(*Continued on page* 187)

Pennsylvania Transformer Company

invites you to meet the **ALL NEW**

P.S.

PERFECT SEAL

Pole Star

DISTRIBUTION TRANSFORMER

- ★ NEW in concept
- ★ NEW in design
- ★ UNMATCHED in performance

An exclusive development of Pennsylvania Transformer Company's Advanced Engineering Department

pt

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • CANONSBURG, PA., Greater Pittsburgh District

PENNSYLVANIA
PERFECT SEAL

Pole Star

DISTRIBUTION TRANSFORMERS

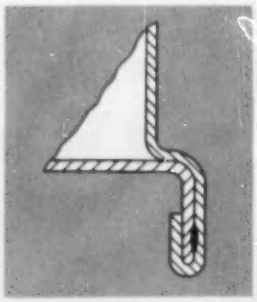
soon available in sizes

5-10-15-25 Kva • without taps • 2400 Volts through 14,000 Volts

In recent years, there has been a decided trend toward completely-sealed transformers. Many present-day power and network transformers are manufactured with welded covers and soldered bushings. Up to now, however, true sealed construction has not been applied to pole-type distribution transformers. Although the various methods of bolting and clamping covers and handholes can produce effective seals at the factory, when transformers are opened by the user there is no way of accurately determining if the transformer is again perfectly sealed. A half-turn of a nut or screw can destroy an effective seal and allow restricted breathing. This permits moisture to be drawn into the tank, where it becomes condensed and remains to possibly weaken the dielectric strength of the windings and oil. Failure of the transformer can result.

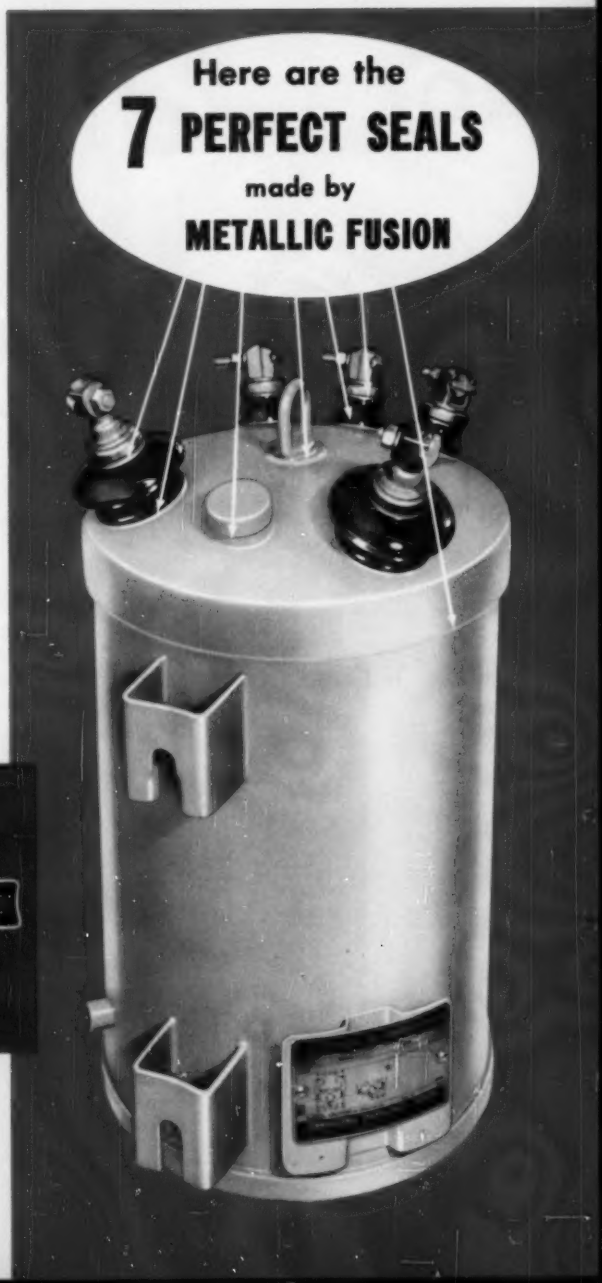
To correct this situation, Pennsylvania Transformer Company engineers have developed the Perfect Seal POLE STAR, a no-tap transformer which is completely and perfectly sealed to provide permanent protection to the transformer. All openings between cover and tank and between bushings and cover are permanently sealed by metallic fusion. Complete electrical tests are made to certify the performance of each transformer. Thus, there is no need for opening the Perfect Seal POLE STAR for inspection or testing prior to placing it into service.

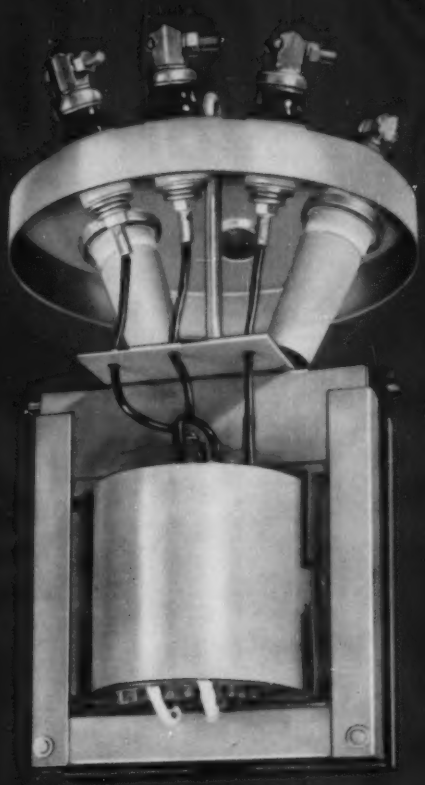
Tooling and preparations for production are now being made, and Pennsylvania Transformer Company anticipates that Perfect Seal POLE STAR transformers will be available in a few months.



Cross section view of tank bottom shows how tank sidewall curls around bottom plate to form a sturdy triple-wall base. The seal is made oil-tight by resistance welding.

Guide bars position core and coil assembly in tank. Bottom section of core frame is "dimpled" to engage embossing in bottom of tank. Cover is permanently fixed to core frame and cannot turn.





Cover and Core and Coil Assembly are permanently joined to form an integral unit which fits into tank.

The Perfect Seal Pole Star is Permanently and Perfectly Sealed by metallic fusion

to keep out { air and water

to keep in { low power factor and high dielectric strength

The Perfect Seal POLE STAR will capture your imagination and win your admiration with outstanding advanced features like these:

- ★ tank cover and all fittings permanently and perfectly sealed by metallic fusion
- ★ core frame welded and riveted (no bolted connections)
- ★ lead support riveted to core frame (no bolted connections)
- ★ all electrical connections crimped or brazed
- ★ all cover clamps and lift lugs eliminated from tank (transformer lifted by eye bolt in center of cover)
- ★ all bushings—high and low—mounted in the cover
- ★ patented "lap-on-top" core construction assures low exciting current and low core loss
- ★ new improved coil construction assures better regulation
- ★ small size and light weight

If it's Permanently Sealed, it's a PERFECT SEAL

P.S. Pole Star

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • CANONSBURG, PENNSYLVANIA

Production line IMPULSE testing is your guarantee that Perfect Seal POLE STAR transformers will never have to be opened.

Every Perfect Seal POLE STAR transformer is impulse-tested to make absolutely certain that it *can* remain sealed throughout years of high-efficiency service. Impulse testing is performed after the units have passed all required ASA and NEMA tests — with each transformer being subjected to impulse voltages that are in accordance with the basic impulse insulation levels required by ASA and NEMA standards.

Since tests are made between layers and turns as well as to ground, these impulse tests simulate the impulse surge conditions likely to occur throughout the entire transformer during actual service. The apparatus used for detecting failures is so sensitive that it will disclose *even* a one-turn high voltage short circuit.

Pennsylvania Transformer Company presents an All-New, All-Steel Shipping Drum with the All-New Perfect Seal POLE STAR.

You'll like the added protection, plus the other advantages, of these new all-steel shipping drums. They'll keep your Perfect Seal POLE STAR transformers *factory fresh* inside and out . . . during shipment and handling as well as during storage indoors and outdoors. The drums are designed to simplify handling and stacking, and to conserve valuable space . . . features you can take advantage of *all the way to the installation site.* Afterwards, of course, you will find dozens of uses for the empty drums . . . in your warehouses, sub-stations, pole yards, and office buildings. Also, all-steel drums eliminate the fire hazard and disposal problem common to ordinary wooden and fibre shipping crates. In short, you get protection *plus* with the Perfect Seal POLE STAR'S all-new, all-steel shipping drums.

POLE STAR

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **CANONSBURG, PENNSYLVANIA**

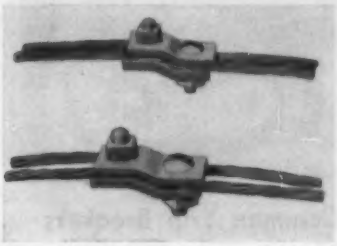
PS655

New Equipment

(*Continued from page* 182)

Transmitter continues its telemetering function if potentiometric device is disabled or removed for servicing.

TF-8 operates over wire line, audio tone, carrier current and microwave channels. Accuracy of both transmitter and receiver is said to be better than 1%. Over-all system provides a response speed of better than 1 sec. **General Electric Co, 1 River Rd, Schenectady 5, N. Y.**



Guy Clamps

Offset guy clamps are said to simplify installation and reduce installation time by having only two high-strength track bolts. Holding power is claimed to be in excess of breaking strength of the strand. Clamps are made of galvanized steel.

They are available in two sizes—one for ¼ to ⅜-in. diam strand, and the other for ⅜ to ½-in. diam strand. **Line Material Co, Milwaukee 1, Wisc.**

Fire Protection System

Pressure-operated, carbon dioxide fire extinguishing system is entirely self-contained and requires no outside power source. It operates on a rate-of-temperature-rise principle and employs carbon dioxide under 850 psi pressure for its power and fire extinguishing agent.

Rapidly rising heat from a Class B or C hazard increases air pressure within one or more small heat actuators mounted in the area. Pressure is transmitted through small diameter copper tubing to master pneumatic control heads mounted on two carbon dioxide storage cylinders. This impulse triggers control heads thus releasing the pressurized carbon dioxide. Released gas enters manifold piping to which other cylinders are connected

A sheltered life...
long and healthy
Collyer Suprene Type RR Cables are used wherever maximum service life is required: in ducts and conduits, and also in aerial service. Available in standard or special constructions. Send for samples and recommendations . . . or let us quote on your requirements.
Collyer
COLLYER
INSULATED WIRE CO.
245 ROOSEVELT AVE.
PAWTUCKET, R. I.

ONAN Announces Two New Series of

POWER PACKED ELECTRIC PLANTS

MORE POWER, LESS WEIGHT, SMALLER SIZE, LOWER COST!

2,500-watt unit weighs only 154 pounds! Gives you more power per dollar than any other 4-cycle electric plant.

Higher output in a smaller, lighter package gives these new Onan units marked advantages for every type of service . . . portable, mobile, primary, or emergency standby.

Wherever you use *portable* electric plants, you can now put more cost-cutting electric light and power to work for you . . . at less cost. In *mobile* applications you can take along more power in less space . . . with less weight. In *primary* and *emergency* standby applications you get more power at less cost with all the Onan advantages of quick starting, long life and easy maintenance.

These new units are *completely Onan-built*, with Onan engines direct-connected to Onan generators in a single compact unit. The new, modern, *short-stroke*, single-cylinder, 4-cycle engines feature extra-large bearings and free-breathing intake and exhaust systems to give you thousands of hours of operation without major servicing. Generators are drip-proof and specially insulated for all-climate, all-season use.

Equipped with carrying frames or two-wheel rubber-tired dollies, Onan AJ and AK series electric plants can be taken anywhere . . . moved around easily on the job.

See your Onan distributor or write for new folder describing all 18 new models

POWERED BY MODERN SHORT-STROKE ENGINES

AK A.C. MODELS 500 and 750 watts, 115 or 230 volts.

AK D.C. MODELS (Battery chargers) 500 and 750 watts, 6, 12, 32 volts.

AJ A.C. MODELS 1,000 and 2,500 watts, 115 or 230 volts.

AJ D.C. MODEL (Battery Charger) 1500 watts, 32 volts

D. W. ONAN & SONS INC.

2843 University Ave. S.E., Minneapolis 14, Minnesota

and opens their valves to increase the flow of gas. Ask for descriptive bulletin.

Walter Kidde & Co, Inc, Belleville 9, N. J.

Common Trip Breakers

Excessive current in either pole of Type TQL 2-pole circuit breaker trips both poles simultaneously. The 2-in. breaker consists of 2 pole units with an interlocking trip mechanism assembled in a single unit. It will fit load centers or panelboards designed for 1-in. Type R or TQL breakers.

Thermal and independent magnetic trip elements provide protection against short circuits and sustained overloads. Momentary overloads will not trip breaker. The device is trip free. It is available in 6 ratings from 10-50 amp for 120/240-v ac. Interrupting rating is 5,000 amp ac.

General Electric Co, Trumbull Components Dept, Plainville, Conn.

Current Meter

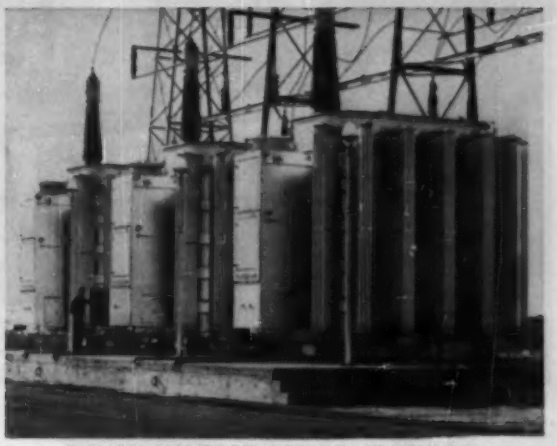
Ultra sensitive current meter determines condition of electrical insulation at any voltage level by measuring low leakage currents, says the manufacturer. TAKK Model 63 measures dc currents from 0.001 to 1,000 mu a with an accuracy of ±4%.

With a multiplier resistor, the meter can be used as a high resistance voltmeter (up to 100 megohms per volt). A suitable voltage source converts Model 63 to a megohmeter with a range up to 150,000,000 megohms.

Hewson Co, Inc, 443 Broad St, Newark 2, N. J.

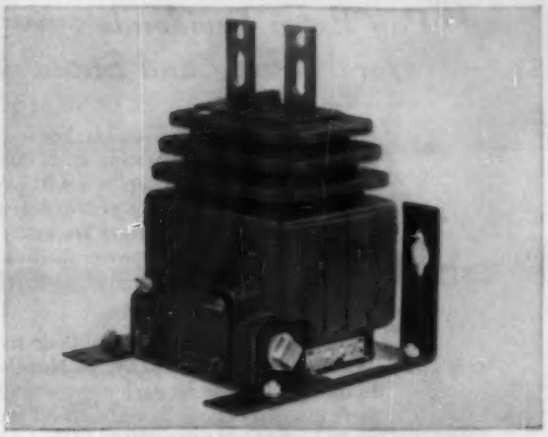
speaking of electricity, what is the best rubber for...

AN ARCTIC RADAR INSTALLATION?...



A HIGH-VOLTAGE POWER STATION?...

AN UNDERGROUND SERVICE CABLE?...



A DUAL-PURPOSE TRANSFORMER CASE?...

Enjay Butyl is outstanding for all!

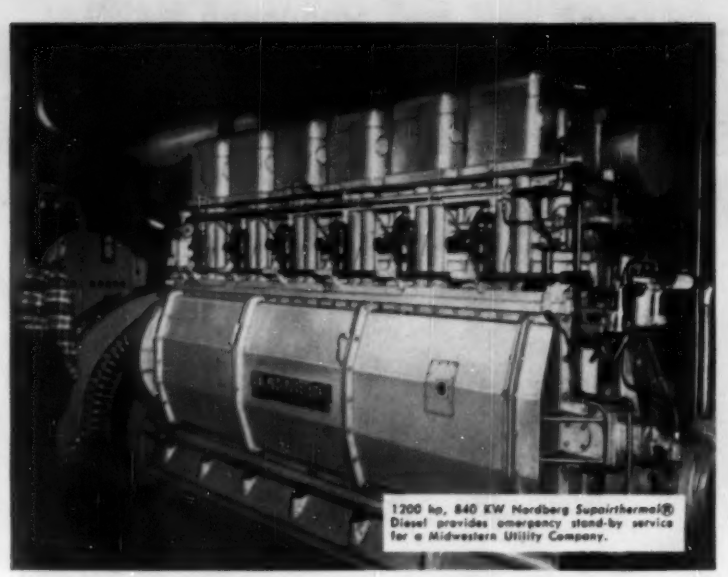
Enjay Butyl retains flexibility to allow radar screens to operate at sub-zero temperatures. Enjay Butyl's superior resistance to corona and ozone gives better performance with high-voltage cables. Enjay Butyl can withstand high internal heat without becoming brittle, making it ideal for use in underground service cables. And Enjay Butyl's excellent electrical properties and all-weather durability enable it to perform the dual function of insulator and casing for a transformer.

That's why the use of Enjay Butyl in the electrical industry is expanding. To find out how these and other advantages of Enjay Butyl can improve your product, contact the Enjay Company.

Our technical representatives and laboratories are at your service.

ENJAY BUTYL

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N.Y. District Office: 11 South Portage Path, Akron 3, Ohio


1200 hp, 840 KW Nordberg Supairthermal® Diesel provides emergency stand-by service for a Midwestern Utility Company.

NORDBERG DIESELS
Pay Extra Dividends for Peaking and Standby Service

If lack of sufficient power makes it difficult to hold peak load generating costs "down" and standby dependability "up"—it will pay you to investigate the advantages of Nordberg engines. These efficient prime movers are easily installed independent of existing power facilities, go on the line quickly and generate low cost power under all load conditions.

Many utilities have assigned their standby power problems to dependable Nordberg engines. In doing so, these modern companies have found them also exceptionally economical for "topping the load" or firming line voltage in outlying areas. This is a sound investment and dividends are paid in the form of increased dependability and economy and more desirable operating flexibility.

As builder of America's largest line of heavy duty engines, Nordberg offers specialized experience second to none, in helping to find the most dependable, economical solution to your specific power problem. Write for further information.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG
DIESEL • DUAFUEL® AND SPARK IGNITION GAS ENGINES

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AMERICA'S LARGEST HEAVY DUTY ENGINE LINE . . . 10 to over 12,000 H.P.

MORE NEW PRODUCTS

E. I. Du Pont de Nemours & Co, Wilmington, Del., offers a more concentrated formulation of "Ammate" **weed and brush killer** . . . Superior Electric Co, Bristol, Conn., has an automatic **voltage regulator** without tubes or moving parts for unattended microwave installations . . . Arrow-Hart & Hegeman Electric Co, Hartford, Conn., has a grounding type **duplex receptacle** with parallel slots for grounding electrical equipment . . . New Rochelle Tool Corp, 322 Main St, New Rochelle, N. Y., offers a line of **high-frequency generators** for induction and dielectric heating in ratings from 25 to 100 kw . . . Pyle-National Co, 1335 N. Kostner Ave, Chicago 51, Ill., has an **explosion-proof floodlight** designed for Class 1, Groups C and D hazardous locations.

Robertshaw Thermostat Div, Robertshaw-Fulton Controls Co, Youngwood, Pa., has a **thermocouple tester** for checking output and temperature.

James-Pond-Clark, 2181 E. Foothill Blvd, Pasadena 8, Cal., has a dual **relief valve** unit capable of controlling temperature induced pressure changes in oil filled power transformers within ±5% of atmospheric pressure.

Bete Fog Nozzle, Inc, 309 Wells St, Greenfield, Mass., has fixed fire protection **fog nozzles** featuring high resistance to clogging, long reach of fog pattern and uniform atomization.

Hammarlund Mfg Co, Inc, 460 W. 34th St, New York 1, N. Y., has Audio-Tone **signalling units** for transmitting and receiving signaling, dialing, telemetering, and other information . . . Industron Corp, Needham Heights, Mass., offers the Model IH-3 **induction heating unit** rated 3 kw . . . Minnesota Mining & Mfg Co, Dept E-584, St. Paul, Minn., offers all weather polyvinyl chloride **pipe wrap tape** with increased adhesion and conformability at low temperatures.

Thor Power Tool Co, 175 N. State St, Aurora, Ill., offers 180-cycle electric **impact wrenches** . . . Lindberg Engineering Co, 2450 W. Hubbard St, Chicago 12, Ill., has a 3 kw high-frequency **induction heating unit** for brazing, soldering and hardening ap-

Southwire means service

Fast, dependable Southwire trucks speed the wide variety of Southwire products all over the country—from El Paso to Scranton, from Duluth to Key West—wherever aluminum or copper transmission or distribution conductor is needed.

Many of Southwire's trucks are on regularly scheduled runs, reaching every nook and cranny in an ever-increasing area. This means that shipments reach their destination *on time* and in less time than normally expected.

Add the flexibility of Southwire's manufacturing schedules to speedy shipping and you have service with a capital S. You also have the reasons why more and more engineers and purchasing agents are specifying Southwire, and why it will pay you to do likewise.

SOUTHWIRE PRODUCTS

MADE IN OUR OWN MODERN PLANT

- **Bare and Weatherproof Copper and Aluminum Wire**
- **Neoprene Copper, Aluminum and Triplex**
- **Copperweld® Conductors**
- **ACSR**
- **Steel Strand, plain or galvanized**

Southwire Company

Telephone: TErrace 2-6311 • Carrollton, Georgia

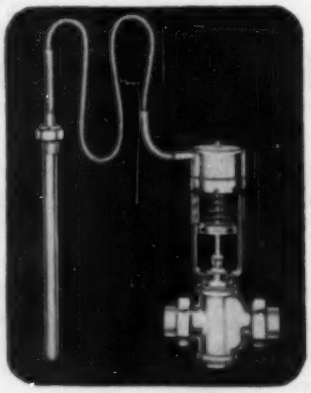
This man and this regulator cut water bill in half!

"Why not use a simple, dependable temperature regulator to shut off cooling water when transformer temperature is sufficiently low?" suggested Substation Operator Bob Ashley of The Detroit Edison Company. And Bob and his associates took action by installing Fulton Sylphon No. 926 Temperature Regulators. The results: the cooling water required for 42 substation transformers has dropped more than 50%—from 684 million gallons a year to 312 million!

Features of No. 926 Temperature Regulator

- Automatically controls temperature of liquids, air or gases.
- Self-operated . . . no electricity, pilots or pistons.
- Automatically opens or closes valve (as ordered) in case of accidental damage to bulb or tubing.
- Available for many 30° ranges between 40° and 250°F.
- Valve sizes from ½ through 4 inches.

Send the coupon today, and find out how Fulton Sylphon controls can improve your operations.



Fulton Sylphon No. 926 Temperature Regulator

Robertshaw-Fulton CONTROLS COMPANY

FULTON SYLPHON DIVISION
EW5-1, Knoxville 1, Tenn.
Please send me data about Fulton Sylphon
☐ Temperature Regulators ☐ Pressure Regulators
NAME_____TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ZONE_____STATE_____

plications . . . McGill Mfg Co, Valparaiso, Ind., has the 155-C **lamp changer** head for R52, 500-w lamps used in high-bay reflector lighting.

Taber Instrument Corp, 111 Goundry St, North Tonawanda, N. Y., has a **materials tester** for determining dynamic hardness and natural lubricity . . . Schenectady Varnish Co, 200 Congress St, Schenectady 1, N. Y., offers high-temperature **wire enamel** which exceeds the requirements of Class B insulation . . . Beckman & Whiteley, Inc, 912 E. San Carlos Ave, San Carlos, Cal., has a portable **instrument** for measuring thermocouple and thermopile indications . . . Peerless Electric Co, Electronics Div, Warren, Ohio, offers a **restorer** for correcting inaccurate temperature reading and control caused by thermocouple failure during heat treating and melting operations.

Sylvania Electric Products Inc, 1740 Broadway, New York 19, N. Y., offers **fluorescent fixtures** with one-piece all plastic shielding.

A. B. Chance Co, Centralia, Mo., offers z.l.n. 100 electrical **contact sealing paste** for aluminum, copper and bi-metal connections.

Hagan Corp, 323 Fourth Ave, Pittsburgh 22, Pa., has an electronic low-voltage **linear amplifier** for low level dc voltage measurement.

Fenway Machine Co, 263 N. 23d St, Philadelphia 3, Pa., offers a **fuse control system** as optional equipment on its line of portable, electric, metal-cutting tools to prevent motor burnout.

Mefco Sales & Service Corp, 1509 Gardena Ave, Glendale 4, Calif., has a hydraulic **instrument** for precision control in load hoisting or lowering operations. Available in capacities up to 12 tons.

Shallcross Mfg Co, Collingdale, Pa., offers a **magnetic bridge** for measuring permeability and core losses of magnetic materials up to 16 kilogausses.

Edwin L. Wiegand Co, 7500 Thomas Blvd, Pittsburgh 8, Pa., has electric **cartridge heating units** equipped with a spring strain relief to protect lead wires from premature breakage.

UPTEGRAFF

OVERHEAD TYPE UD TRANSFORMERS

for power distribution

WINDINGS

Long life is assured by the generous use of high rag-content fullerboard insulation, tied-in turns to meet short circuit forces and heat-reactive insulating varnishes.

CORE

Made from high-grade oriented-type steel. Has low exciting current and low noise level, and remains permanently tight to insure consistent, quiet performance.

TAP CHANGERS

Uptegraff designs feature accessibility, legibility, short-circuit capacity, non-deformable mountings, 360° rotation stops and exceptionally high insulation strength.

BUSHINGS

Securely clamped internally, with generous gasket area to prevent failure of seals. High-voltage bushings (under 15 KV) have spring-loaded contacts; low-voltage have tinned contacts; both for either copper or aluminum conductors.

TANKS

All parts are welded. Shot blasting assures adhesion of primer and finish coats of durable transformer paint. Rolled flange on cover permits high-pressure uniform gasket seal.

SIZES AND RATINGS

Type UD Transformers are built in sizes from 3 KVA to 100 KVA with ratings up to 15 KV.

Write for free copy of new bulletin that details characteristics and other pertinent data.

R. E. UPTEGRAFF MANUFACTURING CO.
Scottdale, Pennsylvania

R. E. Uptegraff Manufacturing Co.
Scottdale, Pa.

NAME_____

ADDRESS_____

CITY_____ STATE_____

EW

The instrument that put electronics to work

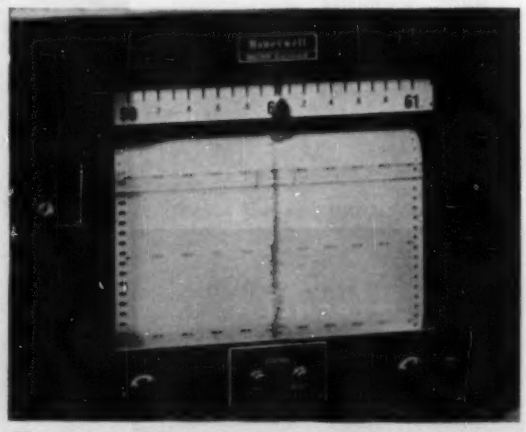
Before electronics came into the picture, industrial instrumentation was caught in a squeeze. On one hand, it was besieged with demands by production men and engineers for higher sensitivity, faster speeds, and greater reliability. And on the other hand, it was hampered by the limitations of mechanical devices. For the instruments of fourteen years ago were merely mechanical imitations of a man watching a galvanometer needle and twiddling dials. They were too delicate . . . too sensitive to vibration . . . too easily led astray by wear or maladjustment. They just couldn't deliver the performance that new production methods required.

In 1940, however, came a major milestone in the progress of instrumentation—development of the *ElectroniK* potentiometer. This was not only a new kind of instrument. It was a new concept of measurement. For the first time, it applied the science of electronics in a practical way to the design of a measuring device for industry. It replaced complicated, fragile mechanical gadgets with a simple but sensitive electronic circuit and servo system . . . the "Continuous Balance" principle of measurement.

You could tell it was something new when you opened up the *ElectroniK* instrument's case. There was no sign of whirring gears, levers and cams. You could tell it was giving a new kind of performance in measurement, too, by the way the pointer would move swiftly and surely in one smooth sweep whenever the measured variable changed.

The *ElectroniK* instrument gained quick acceptance by production men, engineers, research technicians and maintenance men. They liked the way it provided laboratory accuracy and sensitivity, week after week, under the toughest industrial service conditions. They found that its speed and precision made possible improvements in product quality and process operation that had been unattainable before. And they have proved their confidence by ordering and reordering *ElectroniK* instruments by the thousands . . . not solely because it was *first* of its kind, but because it has continued to be the *best* in performance.

ElectroniK frequency recorder sets new standards



The range from 59 to 61 cycles per second is spread across 10½ inches of calibrated chart.

At the Hutchinson Station of Kansas Power & Light Co., an ElectroniK Frequency Controller can be selectively connected to any of three generating units, to regulate the selected one as the master unit for system frequency control.

for measurement and control

RECORDING and controlling of system frequency reaches a new level of performance when the *ElectroniK* Frequency Recorder goes to work for you. By applying the electronic "*Continuous Balance*" principle, this instrument makes available greater precision, speed and sensitivity than ever before possible.

It's more accurate . . . embodies a pulse frequency-to-millivolt converter in a null-balance precision d-c bridge circuit with an over-all accuracy of ± 0.01 cps.

It's fast . . . high-speed electronic balancing follows every change in frequency. Full scale pen speeds of 12 or 24 seconds are available.

It's sensitive . . . responds to frequency variations as small as 0.005 cps . . . spreads the range from 59 to 61 cycles across 10½ inches of calibrated chart.

As a recorder, the instrument gives operators better data on which to base generation changes . . . is also supplied as a dual purpose instrument to chart both frequency and time deviation. As a controller, it incorporates auxiliaries engineered by Honeywell to regulate turbine governors for flat frequency under fluctuating load conditions.

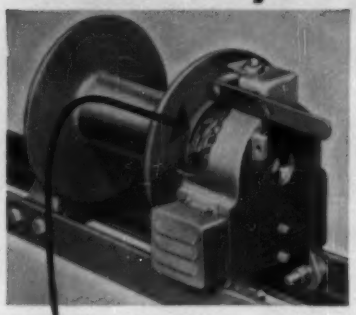
Your nearby Honeywell sales engineer will be glad to discuss applications in your own power plant. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for Catalog 90-1, "Supervisory Instruments for Power Generation".

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Here is the 7000-lb. Winch for you!



Look closely... the Secret's Inside!

Here, at last, is an improved light-duty Gar Wood winch that positively ends the old-time headaches of sticking, freezing, rusting — because all moving clutch parts are *fully enclosed and running in oil.* Neither weather nor dirt can ever get in. Your operator also has much *safer control of the load,* thanks to Gar Wood's exclusive self-energizing safety brake, and time-tested back-draft clutch, which eliminates the hazard of sudden slippage.

More GW plus values

New rust-proof aluminum housing means lighter weight, longer life... dissipates heat much faster than steel. In addition, extra rugged base angles insure a margin of safety many times the rated capacity of the winch. New "built-in" rope clamp also simplifies attaching and changing rope... eliminates U-bolts and other projections that tend to foul spooling. See these great new 7000-lb. winches – standard or low mount – at your Gar Wood distributor today.

GAR WOOD *Winches*

— MAIL COUPON FOR QUICK ACTION —

Gar Wood Industries, Inc.
Main St., Wayne, Michigan

☐ Send free literature on new 7000-lb. Gar Wood Winch

☐ Std. Mount ☐ Low Mount

Name .....

Title .....

Company .....

Address .....

BOOKS

Physics of Dielectrics

Dielectric and Waves. By Arthur R. Von Hippel. Published by John Wiley & Sons, Inc., 440 4th Ave, New York 16, N. Y. 293 pages, illustrated. Price $16.00.

Most engineers in the power field think of conductors as copper, aluminum or silver and of insulation as the covering which isolates energized conductors. To them, the high frequency practice of conducting energy in hollow wave guides to dielectric radiators seems contradictory. Confusion can be rectified by better understanding of "dielectrics."

The author of this book draws upon the physics and chemistry of isolated atoms and molecules and the behavior of electrons and ions to introduce "dielectric synthesis." Thus he enables the electrical engineer to tailor the properties of materials to procure a variety of new tools and release his work from shackling limitations.

The book does not offer direct application to the utility industry. But it is a challenging study for progressive engineers who seek better understanding of scientific theory and experiments in the dielectric field.

Engineering Tables

Conversion Factors and Tables. By O. T. Zimmerman and Irvin Lavine. Published by Industrial Research Service Inc., Dover, N. H. 501 pages. Price $5 per copy in U. S.; $5.50 outside U. S.

Second edition of this 4½ x 6-in. book is a convenient volume for a source of physical relationships and many useful constants for the conversion of units. List of units arranged in alphabetical order, range from abamperes to years. Some new tables included are: Five-place logarithms, foreign monetary equivalents, hardness conversion factors, color scale conversions for liquids, conversion factors for foreign weights and measures for principal countries of the world, and wire and sheet metal gages. This pocket-size handbook should be a valuable aid for engineers, chemists, physicists, draftsmen and others.

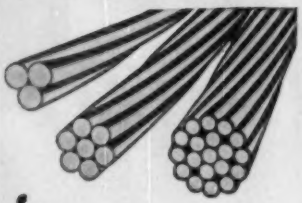
More Adequate Wiring

Home Wiring Handbook. By A. Carl Bredahl. Published by Westinghouse Electric Corp., Mansfield, Ohio. 142 pages, illustrated. Price $1.00.

This new fourth edition conforms to the recently-revised Residential Wiring Handbook of the Industry Committee on Interior Wiring Design and the 1953 National Electrical Code. Its basic change from other editions is its concept of three degrees of electrical living, and its ability to help the builder or electrical contractor establish electrical load in kilowatts for each degree. This approach, says the author, lends greater flexibility to selecting the proper system of distribution for each job.

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

Write us at Monessen, Pa., for complete information

ACCO Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

for Better Value

A LEADING UTILITY EXECUTIVE REPORTS TO HIS MANAGEMENT AFTER INSPECTING OUR PLANT AND FACILITIES

"small enough to be flexible and take care of emergency and rush business . . . large enough to handle quantity shipments in a reasonable time."

Quality You Can Trust

You, too, will find that Porcelain Products' manufacturing facilities are in constant readiness to handle your insulator requirements. We'll be honored to have you come and visit us—inspect our facilities, meet true ceramic craftsmen. But whether you can visit our plant, or not, the *quality* and *performance record* of Porcelain Products' High Voltage insulators signify a depth of manufacturing know-how, research, and individual craftsmanship—working in unison to give you better insulators—with plus values. Visit us, and you'll see why *you* can rely upon Porcelain Products to fill your immediate or long-range insulator requirements *today . . . tomorrow . . . anytime!*

Export Representative: Philips Export Corp., 100 E. 42nd Street, New York 17, N. Y.

YOUR INDEPENDENT INSULATOR MANUFACTURER

61 years

Porcelain Products, Inc.

PP INC.

PARKERSBURG, WEST VIRGINIA

Super power transformers pace utility expansion

Highest rated transformer ever installed in U.S.

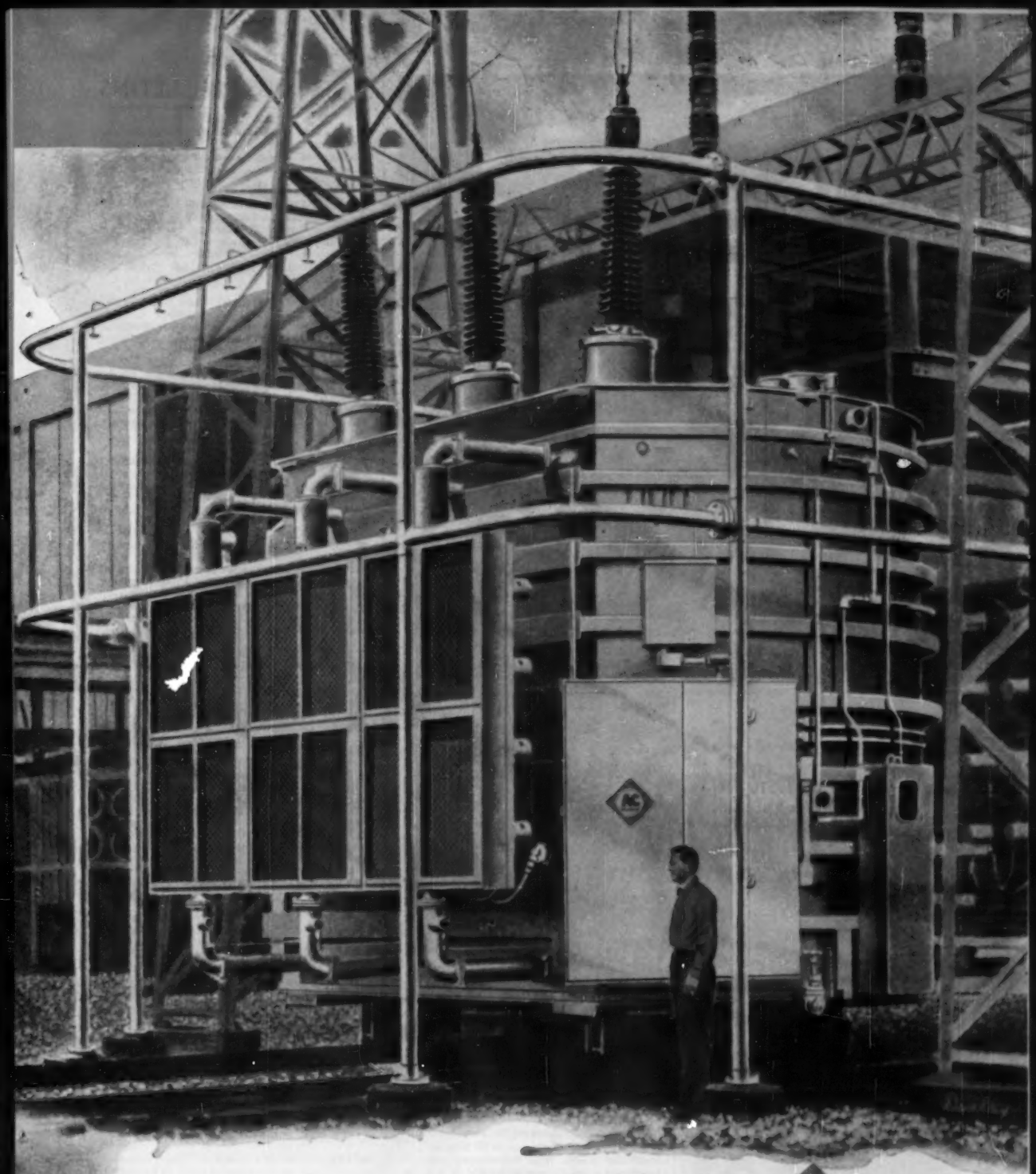
THIS is a 230,000-kva, three-phase power transformer, one of eight of this rating built by Allis-Chalmers to step up voltage for transmission from a steam generating station. Seven of the eight units have been shipped; the eighth will be shipped this year.

This enormous power transformer is an example of the record-breaking, trend-setting units built by Allis-Chalmers for power systems all over the country. Here are some of the features worth noting:

- Like all Allis-Chalmers power transformers, it is corona-free. Regardless of its tremendous size and great number of parts, the creeping deterioration of corona can never shorten this transformer's useful operating life.
- New aluminum welding techniques developed by Allis-Chalmers make this unit 15,000 pounds lighter than standard designs. Structural members are the same strength as before, but weigh far less, so that shipment and installation are easier.
- This transformer tested well below requirements specified for noise. One reason: the extra-quiet cooling system, using Allis-Chalmers developed *Electro-Coolers*. By increasing the number of fans and reducing the individual diameters of each fan, Allis-Chalmers engineers were able to reduce this source of noise significantly without impairing efficiency. Continuous noise research at Allis-Chalmers includes tests of completed transformers at a 10-acre outdoor proving ground where exact field conditions can be duplicated.

An Allis-Chalmers representative will be glad to discuss these and other transformer developments with you at your convenience. Call the nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4713

ALLIS-



CHALMERS

A-C
ALLIS-CHALMERS

General Machinery Division

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of The Union Metal Manufacturing Company

- Reaches hard to get at spots
- Bores holes up to 10 feet deep from any truck position
- Low cost—easy to use—easy to transport
- Industry tested and accepted

DIG HOLES—SET POLES WITH YOUR LINE TRUCK AND
TEL-E-LECT'S POLE HOLE DIGGER

When your derrick truck is equipped with a Tel-E-Lect Digger, your crew can dig a hole and set a pole in less than five minutes! This rugged auger, suspended from a front or rear mounted derrick, is raised or lowered by the winch line. Auger rotation power is supplied through a telescoping drive shaft connected to the PTO.

This efficient digger reaches up on a hill, down into ditches, or across obstacles . . . anywhere up to 20 feet behind the truck. The interchangeable hardened steel augers, 8" to 20" in diameter, are built to operate under the most rugged soil conditions.

Tel-E-Lect PRODUCTS, INC.
10,003 Minnetonka Boulevard Minneapolis 16, Minnesota

CATALOGS • BULLETINS

● **CHARTS:** All-plastic recording instrument charts that are washable and reusable are described in Form 106 1-55. Allegheny Plastics, Inc, Thorn Run Rd, Coraopolis, Pa.

● **TEST INSTRUMENTS:** High-current test instruments for running performance checks on protective devices, reclosers and sectionalizers are described in Data Sheet 455 S. Ratings and characteristics are given. Multi-Amp Corp, 10 Third St, Newark, N. J.

● **COMBUSTION ENGINES:** Bulletin 239 describes diesel and gas engines. It contains product and installation illustrations along with specifications and pertinent data on both engines. Nordberg Mfg Co, Milwaukee, Wis.

● **TIMERS:** Descriptions, time ranges, housing information, dimensions and wiring diagrams of time totalizers are given in Bulletin PB-610. R. W. Cramer Co, Inc, Centerbrook, Conn.

● **BALLASTS:** Electrical and mechanical specifications, wiring diagrams and typical uses for ballasts for cold cathode lamps are contained in Bulletin No. FL-152A. Sola Electric Co, 4633 W. 16th St, Chicago 50, Ill.

● **CONTROL SWITCH:** A magnetically operated glass enclosed switch for general industrial applications is described in Engineering Bulletin 1057. Calibration data, temperature, life and vibration characteristics, and installation information are included. Revere Corp. of America, Wallingford, Conn.

● **SMALL TRANSFORMERS:** Operating details, ratings and dimensions are contained in two bulletins covering transformers for luminous tubing operation, and transformers for mercury lamp floodlighting and indoor illumination. Jefferson Electric Co, Bellwood, Ill.

● **INSTRUMENTS:** Portable millivolt indicators for temperature and calibration studies involving low voltage measurements are described in Data Sheet E-23(1)—4 pages. Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

● **FASTENING TOOLS:** Universal electric Impactools, multi-cycle electric tools and air tools are described and illustrated in a 52-page catalog (Form 5200-A). Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y.

● **FIBER & PLASTICS:** "Engineering Materials For Modern Industry" is the title of a 16-page bulletin covering properties, grades and uses of vulcanized fibre and laminated plastics in electrical equipment. National Vulcanized Fibre Co, 1055 Beach St, Wilmington 99, Del.

● **MOTORS:** Bulletin No. 1879 describes and illustrates totally-enclosed and explosion-proof motors in ratings from 1 to 10 hp. U. S. Electrical Motors Inc, Box 2058, Los Angeles 54, Calif.

● **SAFETY SIGNS:** Over 2,200 stock metal safety signs and tags are illustrated in a 48-page, five-color catalog. Ready Made Sign Co, Inc, 115 Worth St, New York 13, N. Y.

● **FIXTURE HANGERS:** The Unistrut system of fluorescent fixture suspension is described in Catalog No. FF-4. Unistrut Products Co, 1013 W. Washington Blvd, Chicago 7, Ill.

● **ADJUSTABLE SPEED DRIVES:** Bulletin PB4700-1, 4 pages, covers the latest developments in adjustable speed drives. Elliot Co, Jeannette, Pa.

● **TEMPERATURE CONTROLS:** Bulletin F 6143-2 explains types of control systems

(*Continued on page* 202)

Announcing the new MURRAY

SHALLOW TROUGH

...designed for easier installation on larger services

NEW COVER DESIGN prevents meter installation with latch open—makes shorting of line terminals impossible.

3 AVAILABLE POSITIONS for all line and load terminals helps meet wide variety of wiring practices.

"LAY-IN" TYPE NEUTRAL CONNECTOR has snap-out removable top for easiest possible wiring.

5TH JAW can be easily mounted in the field without disturbing existing wiring.

INSULATOR BLOCKS are made of a durable, asbestos-filled, cold-molded material with high insulation characteristics.

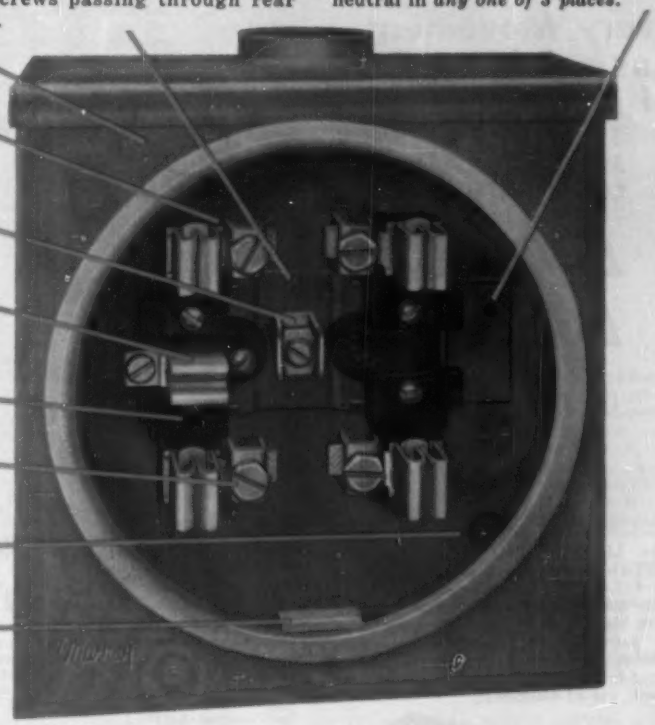
ALL LINE AND LOAD CONNECTORS are conveniently located in wiring gutter—take up to #1 wire.

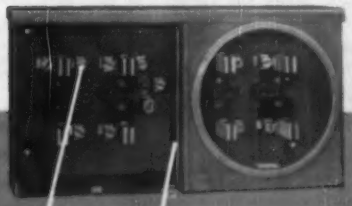
FOUR ¼" MOUNTING KNOCKOUTS in place of holes helps keep water and insects out by eliminating unnecessary openings.

SIMPLE LATCH eliminates cross bar—only tool required for complete installation is a screwdriver.

RIVETED BRIDGE supports all interior components — eliminates corrosion of screws passing through rear wall.

TWO ADDITIONAL TAPPED HOLES in bridge allow contractor to locate neutral in *any one of 3 places.*





2-GANG HORIZONTAL SHALLOW TROUGH

REMOVABLE DIVIDER BAR slips out quick and easy, allows contractor complete access to interior.

DOUBLE CONNECTORS on line side of one meter position simplify on-the-job bussing.

Note: Both horizontal and vertical 2-gang troughs are available with or without factory bussing.

Murray's new shallow troughs are available in either steel or aluminum—with hubs up to 1½". For more information contact your local Murray representative or write Murray Manufacturing Corporation, Dept. EW-1, 1250 Atlantic Ave., B'klyn 16, N. Y.

Murray

"Quality doesn't cost . . . it pays!"

Safety Switches • Service Entrance • Fuse Panels • Meter Mountings • Magnetic-Hydraulic Circuit Breakers • Load Centers

IN CANADA: MURRAY ELEC. MFG. CORP. (Canada) LTD. TORONTO, ONTARIO

Every Movement has a SAVINGS of its own . . . . .

SAVE UP TO 75% of MATERIALS HANDLING COSTS WITH

HEAVY-DUTY FORK
LIFTRUK
OR
LIFT-O-KRANE

Leading Public Utilities find these heavy-duty, rugged SILENT HOIST machines dependable and efficient for the continuous, complex requirements of the transportation department, storage area, repair shop . . . in the movement of Generators and other heavy equipment, Cable, Wire, Maintenance Supplies, Poles and general equipment.

The LIFTRUK *Fork Lift Truck* and LIFT-O-KRANE *Combination Crane and Fork Lift Truck* handle capacity loads with maximum stability and safety. They have high lifting range. Make short turns in narrow spaces. Promote maximum efficiency for storage areas . . . and effect rapid inloading and outloading, with economic use of manpower.

Send for Bulletin 77 for LIFTRUK. Bulletin 75 for LIFT-O-KRANE

Makers of KRANE KAR Mobile Boom Crane, KARRI-GO Front Boom Crane, SILENT HOIST Cranes for Motor Truck Mounting, SILENT HOIST Winches and Capstans, SILENT HOIST Hydraulic Telescopic Truck Towers, etc.

SILENT HOIST & CRANE CO.

Pioneer Manufacturers of Heavy-Duty Equipment for Public Utilities and Municipalities

862 63RD STREET BROOKLYN 20, N. Y.

CATALOGS

(*Continued from page* 200)

for automatic process applications. It includes a guide for selection of proper method of control for process characteristics. Barber-Colman Co, Wheelco Instruments Div, Rockford, Ill.

● **INSTRUMENT CHARTS:** Methods and controls used in producing recording instrument charts are described in a 14-page bulletin. Bristol Co, Waterbury 20, Conn.

● **TOGGLE CLAMP:** Caddy Type H vertical pressure toggle clamp is described and illustrated in an 8-page catalog section. Erico Products Inc, 2070 E. 61st Pl, Cleveland 3, Ohio.

● **ATMOSPHERE CONTROL:** Catalog TD4-620(1), 20 pages, describes the Homocarb Method with Microcarb atmosphere control for heat treatment of steel. Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.

● **CONDUIT:** "Facts About Sheraduct" describes the sheradizing method and gives dimensions and weights for conduit, couplings and elbows. National Electric Products Corp, Gateway Center, Pittsburgh, Pa.

● **INDUSTRIAL CONTROLS:** Electrically operated valves for gas, air, oil, water, steam, and other fluids in various applications are described in a 1955 catalog. General Controls Co, 801 Allen Ave, Glendale 1, Calif.

● **REFUSE BURNING EQUIPMENT:** A 7-page catalog describes construction and application of refuse fuel burning equipment for firing bark, unhogged wood, woodchips, sawdust, selvage, bagasse and other cellulose fuels. Riley Stoker Corp, Worcester, Mass.

● **PANEL METERS:** A 1-page data sheet gives standard ranges, approximate resistances, specifications and dimensions of side indicator panel meters. International Instruments Corp, Box 2954, New Haven 15, Conn.

● **ROLLER SKIDS:** Self-laying track dollies for movement of machinery are described in "Instructions for Best Use of Multiton Roller Skids". Stokvis Edera & Co, Inc, 18 Secatoag Ave, Port Washington, N. Y.

● **PROCESS CONTROLS:** Conventional millivoltmeter construction and its application to a control instrument are discussed in Bulletin No. 9. Information is included to help determine control system type to meet process requirements. Barber-Colman Co, Rockford.

● **LUMINAIRE:** Dimensions, light distribution charts, descriptions and application information for a semi-direct incandescent luminaire, called Paradome, are given in a 4-page folder. Holophane Co, Inc, 342 Madison Ave, New York 17, N. Y.

● **METERS:** Milliohmeters and microhmeters for measuring contact resistance of switches, relays, circuit breakers and commutator resistance in motors and generators are described in Bulletin L-39. Shallcross Mfg Co, Collingdale, Pa.

● **INSULATION:** A 20-page catalog contains descriptions, technical data and application information on treated and coated fabric and paper for electrical insulation. Insulation Mfrs Corp, 565 W. Washington Blvd, Chicago 6, Ill.

● **CONTROLLERS:** Buying information for drum controller, foot switches and limit switches is contained in Catalog 5509 (48 pages). Engineering and appplication data are given, along with connection diagrams and dimensions. Furnas Electric Co, 1026 McKee St, Batavia, Ill.

● **METAL BOXES:** Catalog No. 5, 31 pages, gives construction details and dimensions of over one thousand sizes of drawn metal boxes made of aluminum brass and steel. Zero Mfg Co, Box 509E, Burbank, Calif.

● **CRANE:** An illustrated folder describes a new self-propelled diesel-electric revolving crane with a 150-ft-ton capacity. R. G. LeTourneau, Inc, Longview, Tex.

● **LIGHTING FIXTURES:** Commercial lighting fixtures for fluorescent and slimline lights are described in a 28-page catalog. It contains engineering data, specifications, construction details, installation information and light distribution charts. Marlou Lights, Inc, Fanwood, N. J.

● **EQUIPMENT MOUNTS:** Bulletin K4A, 2 pages, gives engineering specifications and performance data for equipment vibration, shock and noise control products. Korfund Co, Inc, 48-21H 32d Pl, Long Island City 1, N. Y.

● **TIME SWITCHES:** Application information and ratings for light and power time switches are given in Bulletin No. 155. Tork Clock Co Inc, Mt Vernon, N. Y.

● **CONTROL SYSTEM:** Descriptions, applications and ratings of the Industronic system for process measurement and control are contained in Catalog B.36.A-3.55, 11 pages. Weston Electrical Instrument Corp, 614 Frelinghuysen Ave, Newark 5, N. J.

● **DIMMING SYSTEM:** Bulletin 76F, 2 pages, contains ratings, dimensions, wiring diagrams, and a description of operation of a dimming system for hot cathode fluorescent lamps. Ward Leonard Electric Co, 115 MacQuesten Pkwy South, Mount Vernon, N. Y.

TECHNICAL LITERATURE

Drafting Technique — "Simplified Drafting" presents 11 common sense rules for simplified drafting practices. Sample drawings of engineered parts and assemblies illustrate the rules and present a comparison between simplified and traditional methods. Write on company letterhead to J. H. Bergen, American Machine & Foundry Co, General Engineering Laboratory, 11 Bruce Pl, Greenwich, Conn.

Pipe Friction—The "Pipe Friction Manual" contains charts and tables of friction loss moduli, friction factor, roughness factor and viscosity of fluid flow through pipes. It includes tables of resistance coefficients for valves and fittings. Examples show solution of pipe friction problems. Price $1.75—87 pages. Hydraulic Institute, 122 E. 42nd St, New York 17, N. Y.

Lighting—"Lighting for Industry" is a 112-page booklet that covers all types of indoor and outdoor industrial lighting applications. Problems involved and methods of solution arrived at are taken from actual "case histories". Sections are devoted to the economics of lighting, lighting calculations and application of various lamps. Holophane Co, Inc, 342 Madison Ave, New York 17, N. Y.

Solar Energy—"Applied Solar Energy Research" is the title of a 300-page directory of world activities related to solar energy utilization. The book includes a selective bibliography of technical and scientific publications. Each listing gives title and address of the research group, names of principal researchers and brief description of the research program. Available in cloth or paper binding at $5 and $4. Association for Applied Solar Energy, Suite 204, Mayer-Heard Bldg., Phoenix, Ariz.

To meet greater load requirements... rely on Graybar

Modern living today makes 100 amp service the rule rather than the exception. Increased demand for electrical energy on the part of your industrial and commercial customers reflects their growth and the nation's booming economy. For the utility this means continued expansion and improvement of transmission and distribution facilities.

Whatever your needs may be, you can rely on Graybar for prompt and accurate service in meeting them. From the top of the pole to the bottom of the hole, Graybar offers you a single source, a single responsibility for all your pole-line maintenance and construction materials.

Graybar provides accurate catalog and quotation information on more than 100,000 different electrical items — the products of over 300 leading supplier-manufacturers. And you can count on Graybar Specialists to work with your engineers to help solve unusual and difficult technical problems.

528-96

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ALCOA...

GRAYBAR

TWO GUIDES TO SERVICE FOR ELECTRIC UTILITIES

Your Guide to Aluminum Value

Call on GRAYBAR to meet greater load requirements

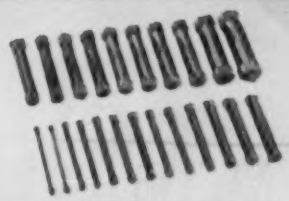
Alcoa and Graybar team up to offer a bonus for business that can't be beat! Here's what you get when you buy through Graybar and specify Alcoa:

1 A single source for all your aluminum conductors and aluminum accessories; undivided responsibility, less paper work, fewer problems of co-ordinating delivery schedules.

2 A complete line of aluminum conductors and aluminum accessories made for each other. Designed, engineered and produced by the world's most experienced manufacturer.

ALUMINUM COMPANY OF AMERICA, 2318-F Alcoa Building, Mellon Square, Pittsburgh 19, Pa.

Always use Alcoa* Aluminum Accessories with aluminum conductors.



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Line Wire and Self-supporting Service Drop Cables

Complete Line of Conductor Accessories

Tools for Applying Conductor Accessories

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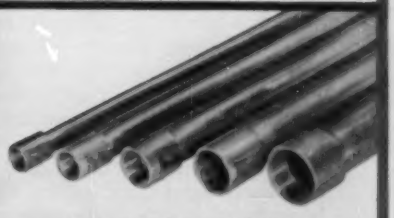
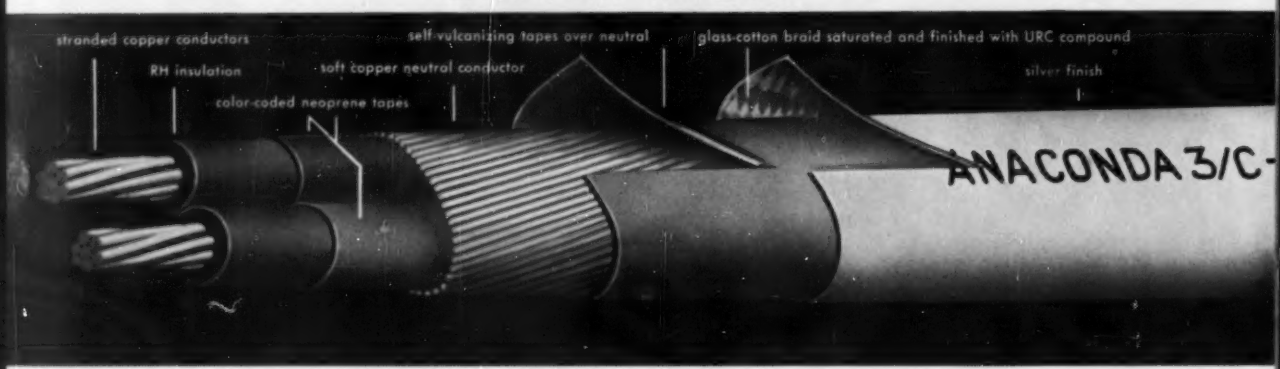


Rigid and Thin-wall Conduit

Call on GRAYBAR to meet greater load requirements

YOU CAN'T HAVE ADEQUATE WIRING **UNLESS** YOU HAVE ADEQUATE SERVICE ENTRANCE



This is Anaconda's new Silvaline-100 Service Entrance Cable—Type SE. It is rated higher than specified by the new Voluntary Adequate Wiring Code . . . yet it costs no more than many lower rated cables.

Adequate wiring *starts* with adequate service entrance!

To the utility it's an indispensable key to the future market for power . . . to the growth of the appliance market . . . and to the avoidance of customer complaints due to low-voltage caused by service-entrance inadequacy.

To give you a truly adequate service entrance today *and for the future*—Anaconda has engineered a *new service entrance cable:* Silvaline-100 made with Type RH insulation for the 100-amp. service into the home called for by the new Voluntary Adequate Wiring Code of the National Association of Home Builders. It costs no more than many lower rated cables. Silvaline-100 can be installed in one continuous run—from pole to meter.

Uninterrupted service . . . no complaints. Silvaline is the only service entrance cable with URC* saturant and finish. Twenty-five years' experience with URC-cable shows it will not festoon or deteriorate . . . assures long life operation and eliminates trouble calls due to shorts.

Silver finish on Silvaline takes any type or color of house paint. You end complaints when you install Silvaline!

Available for immediate delivery. For more information or to order, call the Man from Anaconda. Or write Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U. S. Pat. Off.

ANACONDA®

Call on GRAYBAR to meet greater load requirements

belong in YOUR pole-line program

1 **SELECTION** — Extra value in crossarms, as in many other quality products is the end result of *planned manufacture*. With American Crossarm and Conduit Company, careful selection of timber for manufacture of Rainier crossarms is the first important step.

2 **KILN DRYING** — Rainier kiln drying is superior because of scientific control during the seasoning period — correct temperature and the right humidity all the time while in the kiln means all fungus growth killed—timber seasoned throughout.

3 **SEASONING**—Rainier air seasoned crossarms are also carefully seasoned by control of air circulation and by the location of the seasoning sheds, as well as proper piling of the timber during the drying period.

4 **STOCKS** — The American Crossarm and Conduit Company, manufacturers of Rainier crossarms, through Graybar offer the careful buyer of crossarms an additional service — stocks at strategic locations. For planned-ahead buying or for emergencies, this fact is your assurance of lower shipping costs — quicker service.

Remember! A crossarm produced from improperly or carelessly processed timber might cost less at the time of purchase, but it certainly *is not cheaper per year of life service.*

For further information on crossarms that may pay you dividends in lowered maintenance and replacement costs, write or phone your nearby Graybar Line Construction Specialist. Graybar is located in over 110 principal cities.

AMERICAN · CROSSARM
AND CONDUIT COMPANY
RAINIER
WOOD PRODUCTS
TRADE MARK

Call on GRAYBAR to meet greater load requirements

"Our Welding Machines were repeatedly being shutdown . . *until we changed to Fusetron Fuses*"

"They eliminated production losses due to needless fuse blows."

"Our service shop is headquarters for the Detroit area of Fruehauf's operation. Trucks, tractors and trailers come in for repairs.

"As you know, motor carriers don't make money if they aren't hauling freight. It's our job to have the equipment rolling — and fast!

"But we were having trouble with shutdowns. Ordinary 60 ampere fuses were constantly blowing on our welding machines. We have 12 of these machines — that can be connected to 60 ampere switches located throughout the shop.

"Since many major repair jobs require welding, these shutdowns were really a serious problem for us.

"In an effort to avoid these shutdowns, we installed Fusetron fuses. Since changing, there hasn't been any needless fuse blowing on the welders. Fusetron fuses completely eliminated the trouble."

Clyde Parkins CHIEF ELECTRICIAN
Detroit Branch • Fruehauf Trailer Company, Detroit, Mich.

Call on GRAYBAR to meet greater load requirements

EVERYONE IN THE PLANT CAN BENEFIT BY USING FUSETRON *dual-element* FUSES.

FUSETRON is a trademark of the Bussmann Mfg. Co.

To Electrical and Safety Engineers
Fusetron Fuses Offer Maximum Safety

The 100,000 amp. interrupting rating of Fusetron fuses is apace with the high capacities of today's network systems — and they are adequately safe to meet future circuit growth.

Fusetron fuses reduce the expense of damaged equipment and the danger of fire and other hazards that can result from electrical faults because — they protect against short-circuits, harmful overloads and single phasing.

To Production Engineers
Fusetron Fuses Offer Increased Production

Down-time is reduced, because Fusetron fuses wipe out needless blows caused by harmless overloads or excessive heating of panels or switches.

HERE'S WHY FUSETRON FUSES GIVE ALL-PURPOSE PROTECTION

A fuse link combined with a thermal cutout — the result, a fuse with tremendous time-lag and much less electrical resistance and an interrupting rating in excess of 100,000 amps.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to same dimensions as ordinary fuses, FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Write for bulletin FIS.

To Maintenance Engineers
Fusetron Fuses Offer Savings in Time and Work

Once properly installed, Fusetron fuses require no periodic inspection or down-time necessary on mechanically operated devices.

They protect against irritating interruptions of regular maintenance caused by needless blows. Unnecessary repair work is reduced because — if trouble occurs, Fusetron fuses open and warn of danger before motors or equipment are damaged.

Panels and switches are protected against damage due to poor contact heating.

To Top Management
Fusetron Fuses Offer Reduced Costs

Fusetron fuses cut maintenance costs because they are maintenance free — they increase life of equipment by guarding against damage caused by electrical faults — and they lower production costs by eliminating shutdowns due to needless blows.

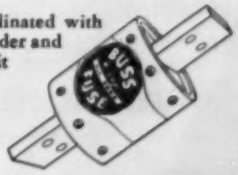
They save waste of space and money by permitting use of proper size panels and switches, instead of oversize.

FOR LOADS ABOVE 600 AND UP TO 5,000 AMPS . . . USE BUSS HI-CAP FUSES . . .

They have unlimited interrupting capacity to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuit of origin.

Write for bulletin HCS.



Play Safe! install Fusetron and BUSS Hi-Cap Fuses throughout the entire Electrical System.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

BUSSMANN MFG. CO. (Division of McGraw Electric Co.)
UNIVERSITY AT JEFFERSON ST. LOUIS 7, MO.

Call on GRAYBAR to meet greater load requirements

"American Brand"

Premium Grade

Manila Utility Rope

MADE IN ALL DIAMETERS FROM 1/4" THROUGH 1"

FOR HAND LINES, POLE LINES, GUY ROPES, HOISTING AND RIGGING.

designed and constructed especially for utility uses

This new rope has been created especially for utilities. Extensive field tests under the most rigorous conditions have proved it vastly superior to ordinary rope.

Only the choicest of Manila fiber is used for Utility Rope. The special construction and exclusive lubricant keep water absorption at a minimum.

Its resistance to weathering is excellent. Get more service for your rope dollar. Buy "American Brand" Manila Utility Rope. Costs a little more—worth it!

Order "American Brand" Utility Rope from Graybar Warehouses in more than 110 principal cities.

A product of

American Manufacturing Company

Noble and West Sts., Brooklyn 22, N. Y.

Look for the single green strand that identifies "American Brand" Manila Utility Rope

*GraybaR QUALITY SINCE 1869 *REG. U.S. PAT. OFF

Distributed by *GraybaR ELECTRIC COMPANY

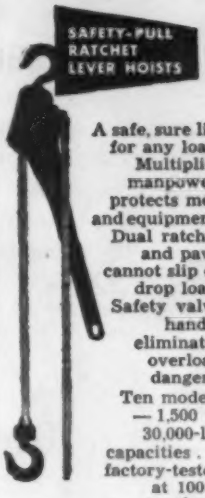
Call on GRAYBAR to meet greater load requirements

users prefer Coffing Hoists

for multiplying manpower · increasing safety · saving maintenance costs

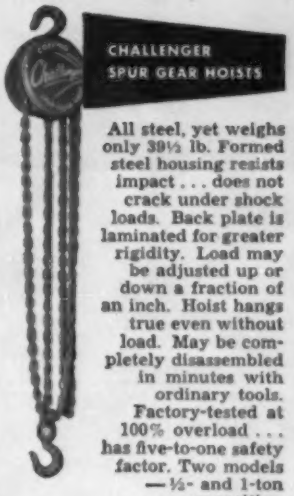
QUIK-LIFT ELECTRIC HOISTS

Ruggedly built for the most continuous assembly line use. For long life, all moving parts are sealed, running in oil. For safety, parts are tested at 100% overload. Seventeen models — 500 to 4000-lb. capacities.



SAFETY-PULL RATCHET LEVER HOISTS

A safe, sure lift for any load. Multiplies manpower, protects men and equipment. Dual ratchet and pawl cannot slip or drop load. Safety valve handle eliminates overload dangers. Ten models — 1,500 to 30,000-lb. capacities . . . factory-tested at 100% overload.



CHALLENGER SPUR GEAR HOISTS

All steel, yet weighs only 39½ lb. Formed steel housing resists impact . . . does not crack under shock loads. Back plate is laminated for greater rigidity. Load may be adjusted up or down a fraction of an inch. Hoist hangs true even without load. May be completely disassembled in minutes with ordinary tools. Factory-tested at 100% overload . . . has five-to-one safety factor. Two models — ½- and 1-ton capacities.

MIGHTY-MIDGET PULLERS

Big pulling power in a small package. Light, compact, a Mighty-Midget hangs easily on a tool belt. Handle can be used either as a lever or a high-speed crank. Two sizes — 500-lb. model weighs only 6½ lb., 1,000-lb. model weighs only 9½ lb.

Coffing Hoist Division

Duff-Norton Company

Danville, Ill.

These Duff-Norton *Jacks*

save utilities time · energy · money

Pole Pulling Jacks

Duff-Norton Pole Pulling Jacks pull or straighten utility poles without laborious digging. Hinged channel base permits jack operation at an angle or in upright position as required. "Service" need not be interrupted when these jacks are used.

Specifications

Jack No.	Capacity Tons	Height Inches	Raise Inches	Base Inches	Weight Pounds
500	15	37⅛	23	10x24	250

Cable Reel Jacks
(single action)

Equipped with adjustable cable reel lift, incorporating a steel hook which can be placed at any point on the lifting rack. Reels of different diameters can be picked up at any height. No. 524-MCR is especially adapted for warehouse use, handling cable, wire, hemp rope, leather belting, etc.

Jack No.	Capacity Tons	Height Inches	Raise Inches	Weight Pounds	Base Inches
520-CR	5	20	11⅛	66	12⅛x26⅛
524-MCR	5	21	14	68	9x19
1022-CR	10	38	12	100	9⅛x24
1522-CR	15	39	11	136	10x24
*1030-CR	10	30	14	110	.....

*Attached to T-Frame Oak Base. Furnished with steel operating bar.

Duff-Norton Company

Main Plant and General Offices, Pittsburgh 30, Pa. · Canadian Plant, Toronto, Ont.

Call on GRAYBAR to meet greater load requirements

YOU KNOW IT'S RIGHT WHEN YOU SPECIFY CHANCE

the best in line construction and maintenance equipment

CHANCE ANCHORS MEET EVERY GUYING NEED

8-WAY EXPANDING
The guy load is distributed all around the anchor—no wasted space between blades. Usually installed in clay or loam.

NO-WREN CH SCREW
For hand or machine installation. Pitch-controlled blade goes down faster and adds to holding power in sandy soil, soft clay or loam.

NEVER-CREEP
Made of structural steel. Pulls entirely against solid, undisturbed earth. For extra heavy loads in clay or loam.

CROSS-PLATE
For heavy-duty anchoring in machine-bored holes. Holds better than logs or slugs. Saves time and money.

SWAMP SCREW
For swamps, marshes, quicksand, river crossings or seasonally flooded areas. Screws down deeply by adding sections of pipe.

8-WAY CONE
Acts as inverted wedge. Flaring base and flat faces increase wedging action. Used in rocky areas with rock wedging.

EXPANDING ROCK
No grouting necessary. The greater the pull, the tighter it wedges against solid rock. Set in 2" drilled hole.

WRENCH TYPE SCREW
All steel—double arc welded. Anchor hub absorbs installation strain. For light loads in sandy soil, soft clay or loam.

POLE KEY ANCHOR
Keys poles at the butt to reinforce them against unbalanced loads in soft soil. Ideal for congested urban areas.

Maplac† covered, splinterproof Pike Poles now laminated for greater rigidity

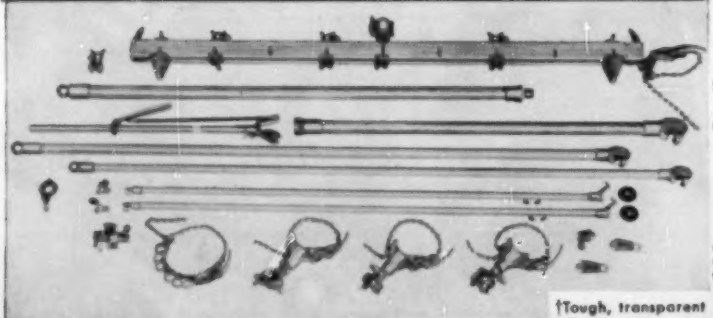
The plastic coating—like that used on Chance hot line tools—increases the service life and adds to the safety of these pike poles. Lamination increases strength and rigidity.

Linemen call this hoist a "HONEY"

designed especially for line work

this one-ton hoist has all the features linemen want

Maplac† covered—Aluminum fitted Hot Line Tools



†Tough, transparent plastic

C84-17A **AGP***

Keeps Tap Connections Troublefree

*Aluminum General Purpose. Coated with fortified cadmium. Protect your conductor with the clamp that's ahead of the trend.

A·B·CHANCE CO·

Call on GRAYBAR to meet greater load requirements

Whatever the LIGHTING PROBLEM in front of you...

thousands of BENJAMIN Quality Lighting Systems assure you of a Superior Solution

1. "Explosion-Proof" Units
2. "Vapor-Tight" Incandescent
3. "Magna-Flo" Continuous Lines
4. "Lite-Line 40" Rows of Light
5. "Magna-Flo" w/27° Lamp Shielding
6. "RLM Dome" Reflectors
7. "Magna-Flo" w/Plastic Covers
8. "Elliptical Angle" Reflectors
9. "Steelite" Armor-Clad Units
10. "Magna-Flo" Individual Units
11. "Symmetrical Angle" Units
12. VOUL Units w/25% Uplight
13. All-white "Diffuser" Reflectors
14. "Sky-Glo" Translucent Ceilings
15. "Stock-Bin-Lite"
16. "Officer" Louvered Units
17. "Panel-Glo" Plastic Ceilings
18. "Varsity" Low-Cost Fluorescent
19. "HD" Projectors
20. "Vapolets" Vapor-Tight Units
21. "Duo-Service" Floodlights

Superior Solutions to lighting problems require the *precisely right lighting system* for the seeing task and environment, plus *quality lighting units* built to deliver this lighting at lowest-per-year cost. With Benjamin you get both.

You get the precisely right lighting system, because Benjamin's line is so complete that thousands of different lighting systems can be created from it. You get lowest-per-year cost, because every Benjamin Unit has the quality and durability which 50 years of experience has proved to be essential.

Get a Superior Solution to your lighting problem! Start now by sending for FREE data bulletins on Benjamin Units for specific plant locations.

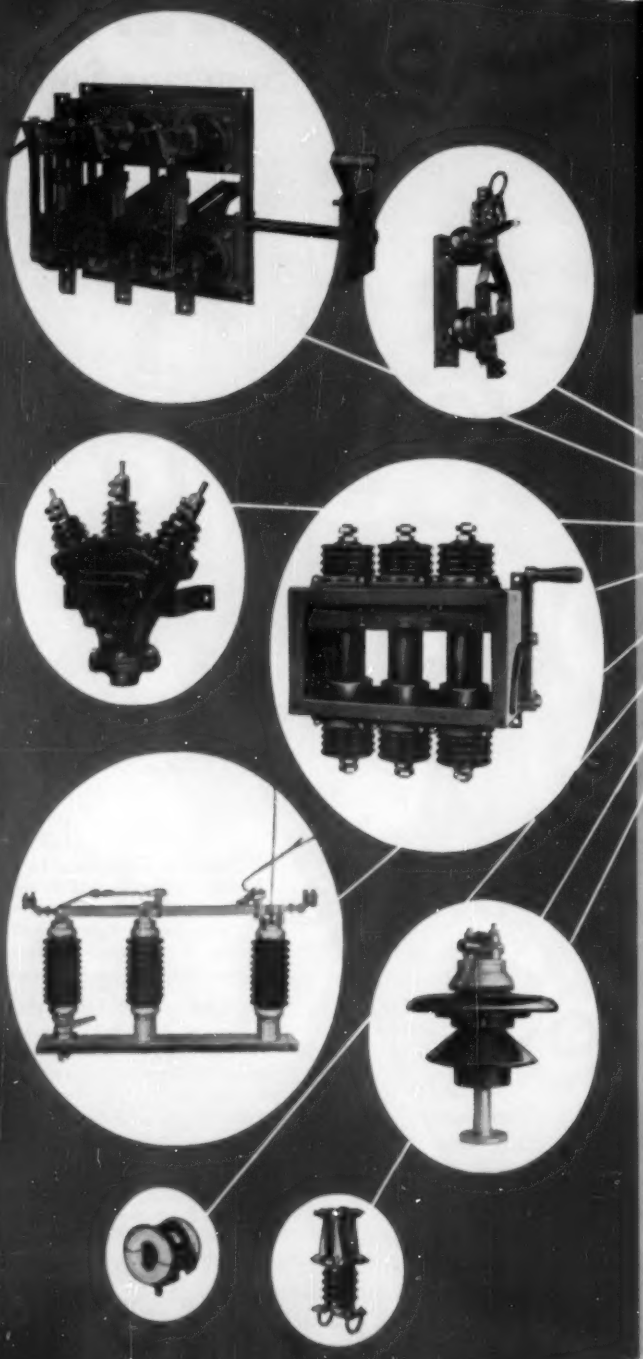
BENJAMIN TRADE MARK

AND *Leader Line*

LIGHTING EQUIPMENT

Sold Exclusively through Electrical Distributors

Call on GRAYBAR to meet greater load requirements



3E

High Voltage Protection with

- DISCONNECTS
- INTERRUPTER SWITCHES
- POTHEADS
- ISOLATORS
- AIR BRAKE SWITCHES
- CLAMP INSULATOR SUPPORTS
- INDOOR BUS SUPPORTS
- OUTDOOR BUS SUPPORTS

SELECT WITH CARE ...
... USE WITH CONFIDENCE

More and more electrified industrial plants are being served from high voltage lines. To help guard against service interruptions, high voltage switchgear and accessories that protect the flow of power should be selected with utmost care.

One way to assure trouble free operation on your equipment is to SPECIFY THREE E.

THREE E high voltage switchgear and allied products are soundly engineered, built of high grade materials, with a "know how" accumulated in more than forty years of painstaking manufacture.

THREE E

ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

Illustrated bulletins available

Call on GRAYBAR to meet greater load requirements

EVERSTICK ANCHORS

FOR TOUGH ANCHORING JOBS!

Today's anchoring jobs bring Eversticks to the forefront. They provide tight, safe anchoring . . . always in excess of rated capacities. Easy and quick to install . . . made of finest grade maleable iron with superior rust-resisting qualities and exceptional toughness. Every Everstick is plainly marked for ease of handling and storing.

The nut housing feature of the Everstick prevents rod from slipping thru while installing and provides a solid substantial base for the expanding blades.

There's a complete line of Eversticks for all strain requirements. 15 sizes of 2-way—3-way—4-way types.

THE ANCHOR OF MERIT

EVERSTICK ANCHOR CO., Fairfield, Iowa

Call on GRAYBAR to meet greater load requirements

Call Graybar and ask about

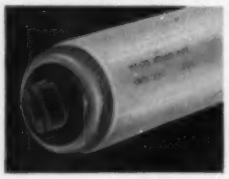
DAY-BRITE "COMFORT-LIGHTING" FIXTURES

The new Day-Brite CFI (Comfort For Industry) fixture — available for high-output, rapid-start lamps —appeals widely to plant men because it boosts worker morale and efficiency.

By *combining both downward and upward lighting,* the new CFI fixture washes out ceiling brightness contrasts and greatly reduces worker discomfort resulting from "eye shock." This gives contractors a strong selling point.

FOR HIGH-OUTPUT, RAPID-START LAMPS

There are two new "Comfort For Industry" Day-Brite lifetime fixtures — the CFI-10 and CFI-25. Each will accommodate the new 8-ft. High-Output, Rapid-Start lamps.



for high-output, rapid-start lamps

SEE!

EXAMINE!

COMPARE!

Then choose Day-Brite CFI fixtures—their superiorities are self-evident.

DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

Day-Brite Lighting, Inc., 5417 Bulwer Avenue, St. Louis 7, Missouri.

5453

CFI-25 with 25% upward lighting component and 30° crosswise shielding

Two-lamp units are available for the newly developed 8-ft. High-Output, Rapid-Start lamps. Also available are two-lamp units for 8-ft. Slimline lamps and for 4-ft. Rapid-Start lamps. All-steel, reinforced construction is used throughout, including reinforced die-embossed ribbing to insure greater reflector rigidity — reflectors are one-piece all porcelain enamel, the LIFE-TIME FINISH. The truss-like channel features a ribbed top section, so that sliding clamp hangers may be positioned anywhere along the run.

CFI-10 with 10% upward lighting component

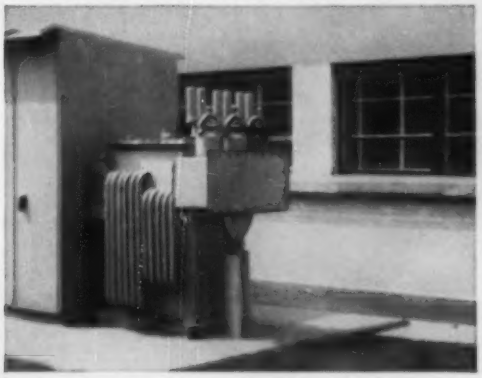
Two-lamp and three-lamp fixtures engineered to provide a 10% upward lighting component, the CFI-10 is basically similar to the CFI-25.

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

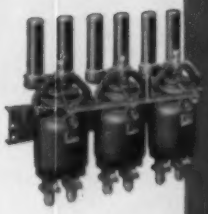
Call on GRAYBAR to meet greater load requirements

PICK UP THAT LOAD

Protect your feeder with G&W type "FC" oil fuse cutouts
Combination Fuse-Switch – heavy all steel housing
provides safety to men and equipment



TYPE "FC" OIL FUSE CUTOUTS
2500—5000—8000 VOLTS TO GROUND



All steel enclosure, hermetically sealed–oil filled, protects men and equipment by safely withstanding high pressures of high voltage fuse clearing a heavy short circuit. In addition to the main purpose–a pressure tight enclosed fuse–the device serves as a full load break oil switch, three phase with gang-operated mechanism. Switching contacts are Beryllium copper. Fuse links are simple, inexpensive and easily replaced. Cable entrances are interchangeable –wiping sleeve, stuffing box or plain porcelain. Type "FC" cutouts are arranged for mounting on connection boxes, on steel structures or walls.

Write us or our representative for latest "CA" bulletin for further data

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois
Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

50th ANNIVERSARY G&W 1905-1955

C543

G&W

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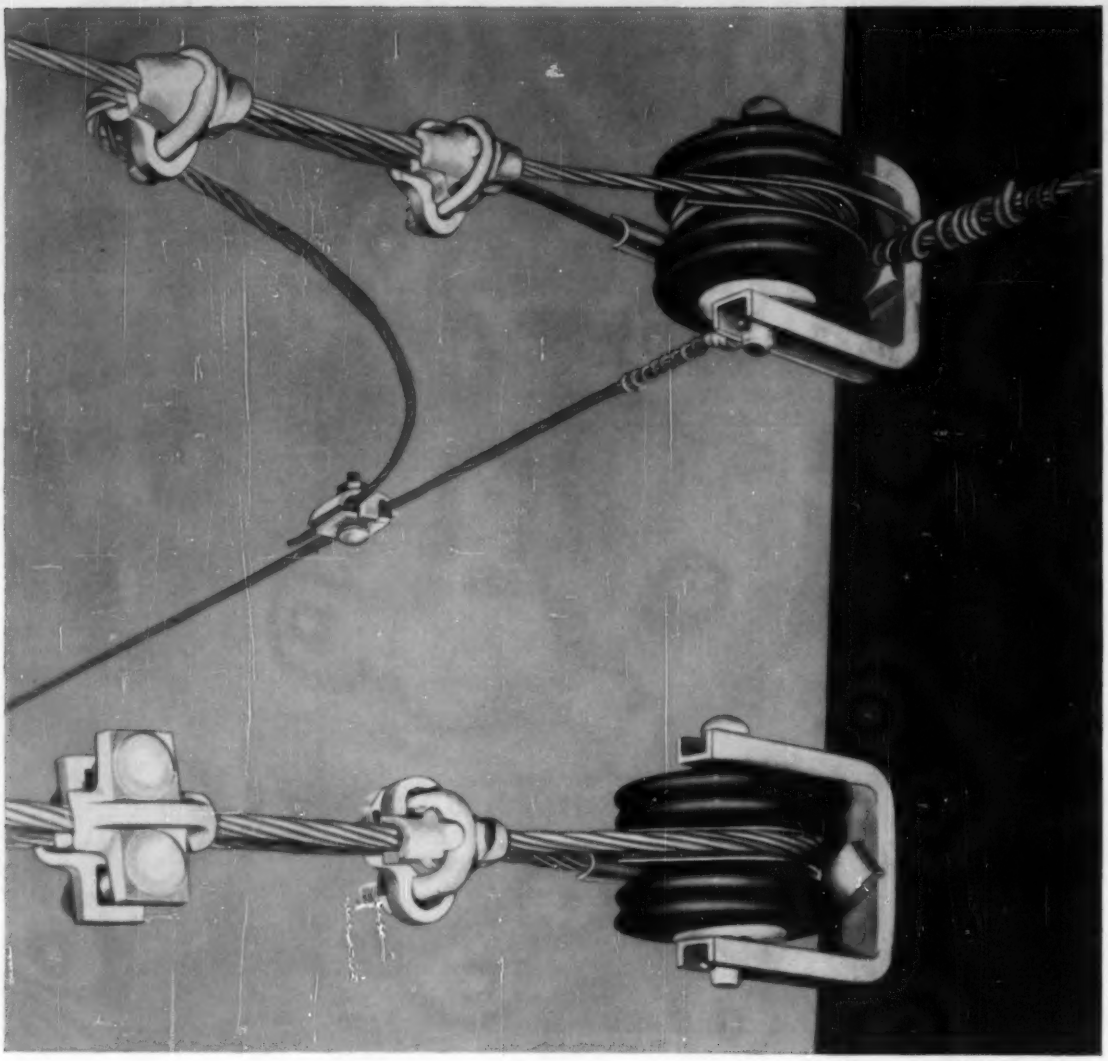
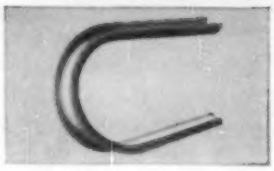


The new Hubbard thimble
...for use with aluminum conductors



This aluminum thimble has been designed by Hubbard for use in connection with aluminum conductors on clevises, racks and other similar secondary installations. The thimble provides a larger radius for the conductor loop than is provided by the normal rack or clevis insulator. This eliminates the weakening stresses that are set up in aluminum conductors when the conductor loop is too small.

The Hubbard aluminum thimble accommodates conductors up to ½" in diameter, with a conductor loop radius of 1¾".

This new aluminum thimble can be obtained from your Hubbard distributor. He also has a complete selection of pole line hardware and other electrical construction specialties in stock for immediate delivery. Call him any time. Or, contact Hubbard and Company, 6301 Butler Street, Pittsburgh 1, Pennsylvania.

HUBBARD AND COMPANY

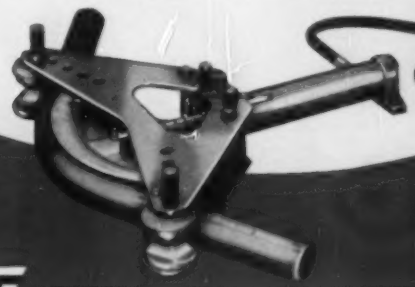
Pittsburgh 1, Pa.
Chicago 50, Ill.
Oakland 8, Cal.

Call on GRAYBAR to meet greater load requirements

new LIGHTWEIGHT Greenlee Bender

easy portability . . .
extra versatility . . .
extra power . . . 15 tons!

Here's the kind of real portability you've been looking for in a bender for ½" to 2" conduit. New GREENLEE No. 880 Hydraulic Bender of advanced type construction is unusually *lightweight*, yet extra rugged, fast, *powerful*. Easily carried by one man . . . easily operated by hand, or can be used with a power pump for fast production jobs. Makes complete 90° bends with one ram stroke. Quickly pays for itself in time and materials saved. Get complete details from your electrical distributor.

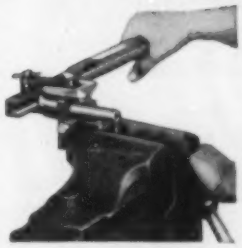


TOOLS FOR CRAFTSMEN

GREENLEE

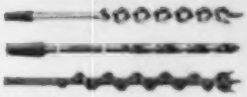
Knockout Punches and Hydraulic Punch Driver

Quick, easy way to make knockout enlargements for ½" to 4" conduit. Simply insert GREENLEE Knockout Punch in knockout or small drilled hole, then turn with an ordinary wrench. For an even faster, practically effortless operation, drive Punch with powerful, portable GREENLEE Hydraulic Driver shown below.



Hand Benders for Tubing

Swiftly produce accurate small-radius bends (up to 180°) in conduit, pipe, and tubing. No flattening or kinks. GREENLEE Hand Benders are especially designed to form neat bends to fit sharp corners, nooks, and other close quarters. Eliminates need for many manufactured bends and fittings. Various sizes and models . . . handy companion tools to GREENLEE Hydraulic Benders for quickly "custom making" your own complete conduit installations *right on the job.*



Boring Tools For quickly making clean, smooth openings for conduit and wiring. The GREENLEE line includes Electricians' Auger Bits and Electric-Drill Bits, Bell Hangers' Drills, Expansive Bits, and Bit Extensions.

Cable Puller Easy-operating, compact unit for 7,500-pound pull. Fastens directly to conduit for pulling in line with conduit . . . no loosened hangers. Attachment available for concealed conduit work.

Call on GRAYBAR to meet greater load requirements

WHEREVER GROUNDING IS A "MUST"

. . . the 3-wire cap with U-shaped grounding blade, shown above, answers an urgent customer need. As you know, it is required by N.E.C. and U.L. on many types of portable electrical equipment rated 125 volts or less.

Point is this: some of your customers may be surprised when they receive portable tools, machine tools, electric typewriters, etc., equipped with this new 3-wire cap. It may present a plug-in problem — unless they have the receptacles, adaptors, connectors, etc., to accept the new U-shaped grounding blade.

You can be of great service by advising them about the devices they'll need. Tell them that Hubbell has a complete grounding line to meet every requirement. Hubbell wiring devices satisfy the top industrial standard for rugged, dependable performance.

Also a complete line of 250-volt rated grounding devices.

Literature on request.

Highest Grade HEAVY DUTY WIRING HUBBELL DEVICES

FACTORY WAREHOUSE LOCATIONS ASSURE NATIONWIDE STOCK AVAILABILITY

37 South Sangamon Street, Chicago 7, Illinois
11-15 Park Place, New York 7, New York
103 North Santa Fe Avenue, Los Angeles 13, California
542 Natoma Street, San Francisco, California

HARVEY HUBBELL, INC., DEPT. E-2 **BRIDGEPORT, CONNECTICUT** 19HHSSR

Call on GRAYBAR to meet greater load requirements

FOR THAT *Extra Safety Factor* IN

Overhead Ground Wires

Specify Crapo Weldless Galvanized STEEL STRAND

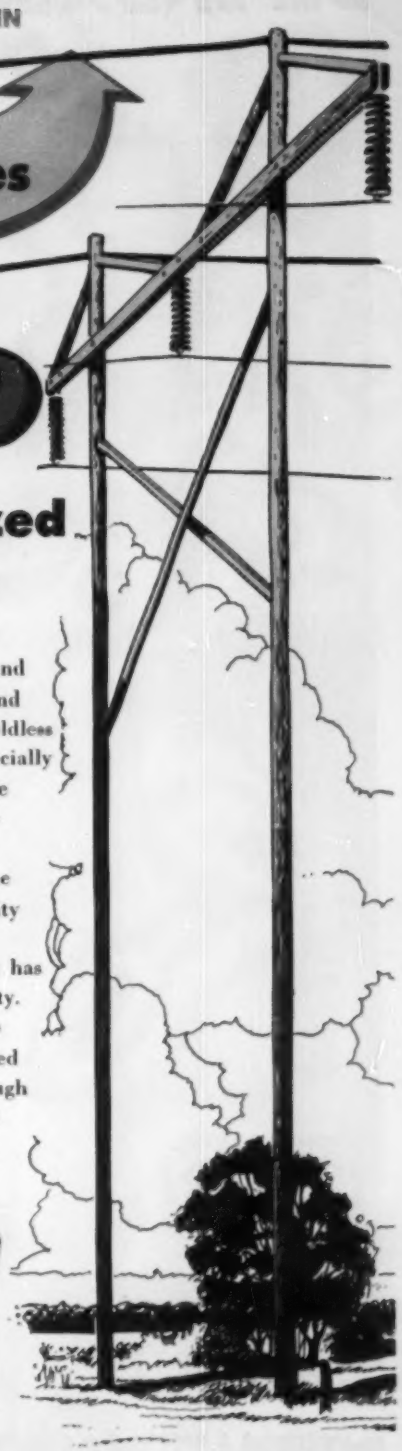
To obtain maximum strength and dependability in overhead ground or static wire, specify *Crapo* Weldless Galvanized Steel Strand. This 7-wire steel strand, designed especially for shielding power transmission lines against lightning, is made in continuous lengths without welds or joints of any kind either in the individual wires or in the finished strand.

Crapo Weldless Galvanized Steel Strand combines *all* of the tensile strength inherent in steel with a ruggedness and durability which make it the most practical and economical overhead ground wire. Because of its superior physical characteristics, it has a high fatigue endurance limit, provides a greater factor of safety.

Like all *Crapo* galvanized steel strand, it is manufactured to highest quality standards and in conformity with latest approved specifications. *Crapo* Weldless Steel Strand is available through Graybar Electric Company in the sizes and grades best adapted for use as overhead ground wire.

Ask your Graybar representative for a copy of this booklet containing Sags and Tensions for Crapo Galvanized Steel Strand where used as overhead ground wire -- or write for Booklet OG-25!

INDIANA
Steel and Wire Co., Inc.
MUNCIE, INDIANA



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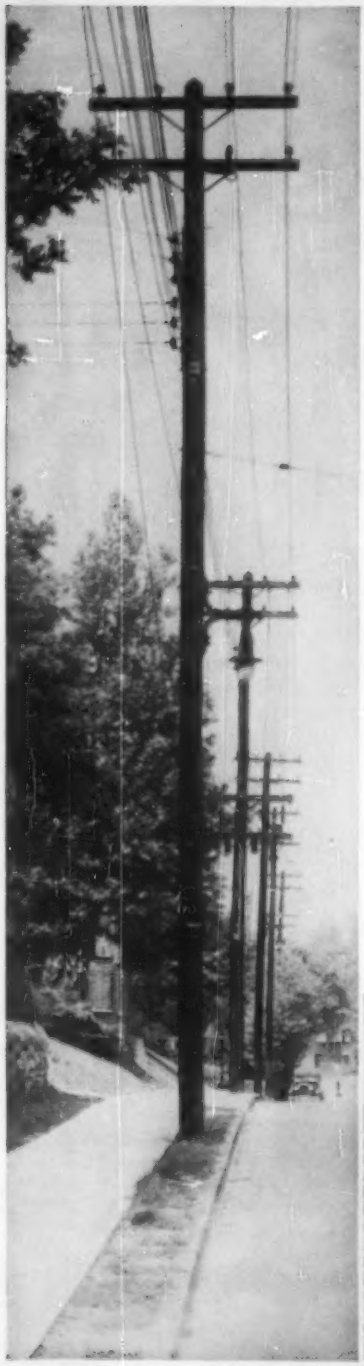
DEPENDABLE



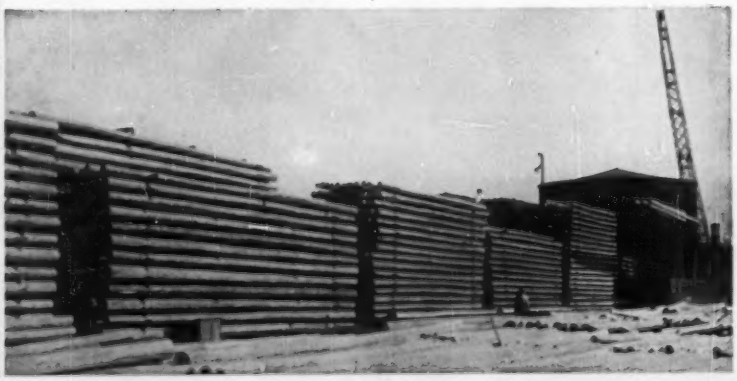
Poles

of
Selected Sound Timber
Scientifically Treated

THE lasting strength of International Creosoted Pine Poles plus their low ultimate cost makes them the safest and most economical poles that can be purchased. For more than 80 years, numerous service records of pole treatments have been utilized to perfect the present production practices for International Creosoted Poles. As a result of the lessons learned during this long experience, International Creosoted Poles will assure trouble-free, continuous service. Their straight, clean, smooth surfaces perfectly adapt them for street lighting, rural and urban distribution.

International Creosoted Pine Poles are manufactured and distributed by two of the oldest companies serving the utility industry. They have grown up together, ready always to serve with quality poles, framed correctly, and shipped when needed.

Distributed by GraybaR Electric Company



INTERNATIONAL CREOSOTING & CONSTRUCTION CO.

PRODUCERS OF HIGH GRADE TREATED TIES, POLES, PILES, ETC.

Galveston — Beaumont — Texarkana

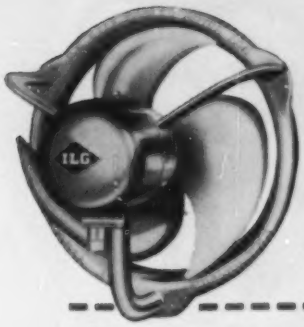
Call on GRAYBAR to meet greater load requirements

maintain an

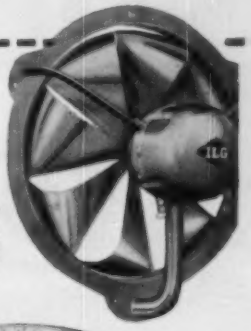
"Air of Efficiency"

with

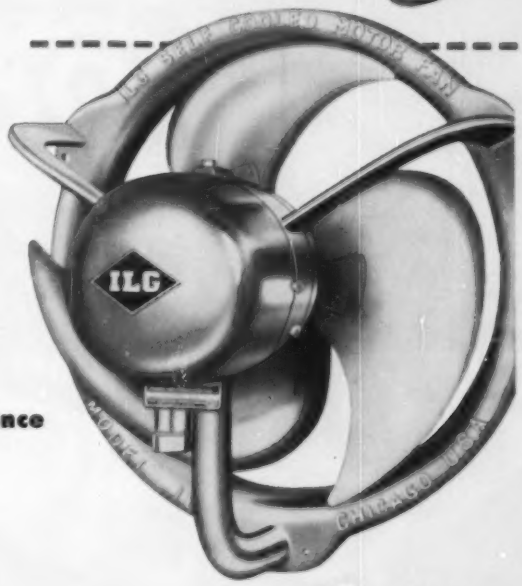
ILG®



TYPE "P"—high speed, maximum air volume within minimum dimensions. For use on systems up to .6" static pressure. Self-cooled motor. 4 sizes.



TYPE "W"—for large diameter wheels, 60" to 72" sizes. Dynamically balanced wheel. Rigid, sturdy frame. Self-cooled motor.



TYPE "G"—powerful, quiet, efficient . . . plus long life, minimum maintenance. Self-cooled motor. 6" to 48" diameter wheels.

TYPE "E"—has TYPE "Q" wheel and ball bearing, explosion-proof motor. Non-ferrous frame. 16 capacities.

PROPELLER FANS

• faster air change • minimum maintenance • lower power costs

Efficient operation calls for efficient ventilation . . . ILG ventilation! Equipped with self-cooled motors, Ilg Propeller Fans assure you longer, trouble-free, dependable performance. Rated and certified under standard testing codes, you can count on Ilg Fans to move more air. Dynamically balanced fan wheel, direct-connected to motor, assures smooth, quiet, free-running operation. And Ilg's famous "one-name-plate" guarantee covers both fan and Ilg-built motor as a unit.

You can choose an Ilg Fan from a complete range of sizes . . . 6" to 72". And you can expect fast delivery, too, because adequate stocks of Ilg Fans are maintained everywhere. You'll find experienced ventilating experts in all principal cities . . . ready and able to solve your air-moving problems. See your dealer, or write . . .

ILG ELECTRIC VENTILATING CO.

2850 N. Pulaski Road, Chicago 41, Illinois

Call on GRAYBAR to meet greater load requirements

It Pays to have the Right Equipment

NEW

SWIVEL POINT
CANT HOOK

Write for full line catalog

OSHKOSH

POLE LINE TOOLS

LEACH COMPANY · OSHKOSH, WISCONSIN

Since 1887

NEW

CURVED HEAD
TAMPING BAR

Call on GRAYBAR to meet greater load requirements

STRONGER THAN THE PIN

In laboratory tests to determine the torsion strength of Kimble *Tempered* Glass Insulators, wood pins were sheared off, and lead-bushed threads stripped, with no failure of the Insulators. Cantilever tests using special alloy pins were discontinued at 10,000 lbs. with still no failure. Ultimate impact tests averaged 130 inch pounds!

Kimble *Tempered* Glass Insulators save installation time because it's never necessary to loosen for lineup with the conductor. Their great strength always allows another quarter-turn.

If it's on the pin, it's in service

Tests far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air. Even lightning surges have failed to damage them. In the event of shattering due to severe mechanical shock, insulator disintegrates into small, non-sharp fragments. Trouble shooters can locate broken insulator—fast.

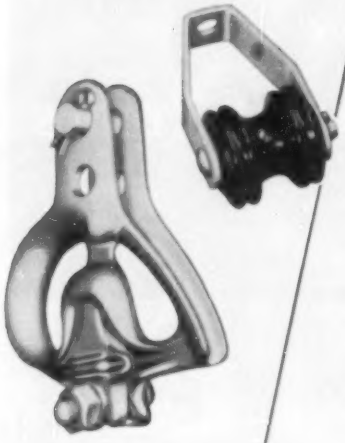
What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Insulator Division, Owens-Illinois, Dept. # EW-6, 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

Call on GRAYBAR to meet greater load requirements



when you use O-B

Everything Always Fits

Despite the number of insulator and hardware combinations that come up in distribution work, you'll never find mis-fits between Ohio Brass materials. Balls and sockets; clevises and tongues always match. Clamp keeper-pieces move freely; never bind or jam. Free-turning nuts and bolts let linemen work quickly!

O-B makes both insulators *and* hardware; knows the requirements of both; and designs to make sure both classes of materials work well together. Just as important to you is this:

O-B hardware is shipped to Graybar in sturdy containers, protected from shipping and handling damage. After making every precaution at the factory to see that O-B hardware and insulators will match, we insure that accuracy by protecting the hardware with strong packaging until it is delivered to the user.

Go to Graybar for O-B distribution hardware and insulators. They are sure to match, even though you combine newly-shipped suspensions with clamps that have been in stock for a year or more! Whatever the combination, it will fit if it's O-B!

Ohio Brass

MANSFIELD OHIO, U. S. A.

4540-H

NEW

No. 53-XPJ Nicopress Tool with *Three Grooves*

Accommodates Nicopress Sleeves

FOR COPPER

1 solid, 1 seven strand, 2 solid, 2 seven strand, 2 three strand, 3 solid, 4 solid, 4 seven strand, 4 three strand, 6 solid, 6 seven strand, 8 solid, 8 seven strand, 3 No. 10, 3 No. 8.

FOR COPPERWELD

4A, 6A, 8A, 6C, 8C, 6D, 8D, 9½D, 3 No. 10, 3 No. 12, 4 solid, 6 solid, 8 solid, 10 solid.

FOR ALL-ALUMINUM

2 solid, 2 seven strand, 4 solid, 4 seven strand, 6 solid, 6 seven strand, 8 solid.

FOR AMERDUCTOR

8SCP or SCG, 10SCP or SCG, 12SCP or SCG.

Write for descriptive folder.

Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and foreign countries.

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

Call on GRAYBAR to meet greater load requirements

MERCOID® CONTROLS

FOR PRESSURE, VACUUM, TEMPERATURE, LIQUID LEVEL

MERCOID
MERCURY SWITCH EQUIPPED
CONTROLS ARE AVAILABLE
FOR EVERY TYPE OF
SERVICE

FOR GENERAL
PURPOSE
(Nema 1)

WEATHERPROOF
FOR OUTDOOR
SERVICE
(Nema 1A, 2, 3, 4)

EXPLOSION-PROOF
FOR HAZARDOUS
LOCATIONS
(Class 1, Group D.)
(Class 2, Group E, F, G.)

MERCOID CONTROLS FEATURE
VISIBILITY OF "ON-OFF" CIRCUIT
VISIBLE CALIBRATED DIAL
OUTSIDE ADJUSTMENT—
NO TOOLS REQUIRED
NO CONTACT CLEANING
TWO-WIRE HOOKUP

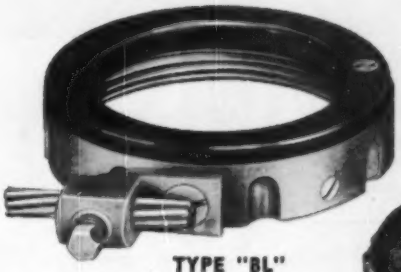
THE MERCOID CORPORATION
4219 BELMONT AVENUE • CHICAGO 41, ILLINOIS
New York: 205 E. 42nd St. • Philadelphia: 3137 N. Broad St.

Call on GRAYBAR to meet greater load requirements

THERE'S AN O.Z. BUSHING FOR EVERY JOB

TYPE "B"

Strongest insulating bushing available! Exclusive design permanently locks insulation into casting.



TYPE "BL"

Same as proven Type "B" with lug for quick, positive ground connections. Set screw in casting facilitates positioning.

TYPE "A"

Finest, high-strength, all-Bakelite insulating bushing. A top quality bushing—competitively priced!

All-Bakelite bushing with male thread for insulation of exposed cables passing through holes in metal boxes or troughs.

TYPE "BB"

Over 35 years of specialized experience in the design and manufacture of conduit fittings is behind the complete line of O.Z. insulating bushings. Whatever your insulating bushing problem, you can be sure there is an O.Z. design to fit your application perfectly. Buy O.Z. bushings from your local electrical distributor.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND ST. • BROOKLYN 2, N. Y.

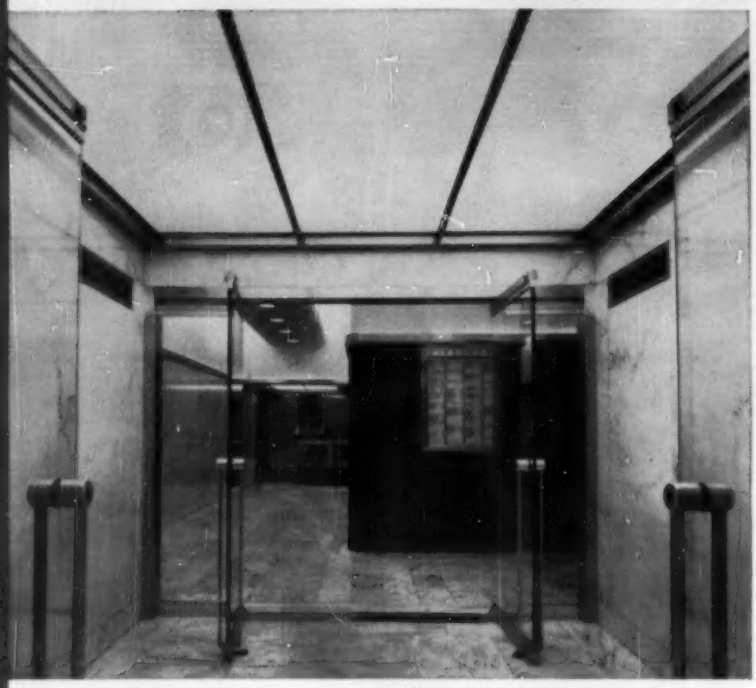
CAST IRON BOXES • SOLDERLESS CONNECTORS
CABLE TERMINATORS • GROUNDING DEVICES
POWER CONNECTORS • CONDUIT FITTINGS

Representatives in all principal cities

Call on GRAYBAR to meet greater load requirements

Blue Cross Office Building
Philadelphia, Pa.

ceilings that radiate light



PITTSBURGH LUMA-CEILINGS

A NEW CONCEPT IN LIGHTING...

ADVANTAGES

TO THE OWNER

- Economical initial cost
- Diffused glare-free illumination
- Controllable light levels, if required

TO THE ARCHITECT

- Applications unlimited in new work or modernization
- Economical ceiling construction
- Obstruction-free ceiling plane

TO THE CONTRACTOR

- Easiest ceiling lighting system to install
- Underwriters' Laboratories listed
- A standard line, replacement parts are always available

The Luma-Ceiling is Pittsburgh Reflector Company's answer to the need for an all-purpose illumination source that is simple to install and easy to maintain. Light from Luma-Ceiling is soft and diffused with a quality similar to indirect lighting; no sharp shadows or contrasts are evident.

Pittsburgh's Luma-Ceilings have been used successfully in office buildings, laboratories, libraries, showrooms and a wide range of similar installations. Wherever they have been used, people who have worked with this type of lighting consider it the most ideal lighting medium yet devised.

The ceiling itself is a combination of translucent, corrugated, white vinyl plastic supported in extruded aluminum channels; the light source is either Pittsburgh Standard Fluorescent or Pittsburgh Slimline Strip.

See How Pittsburgh Luma-Ceilings can fit into your lighting picture. Bulletin 10 gives complete details; write for it.

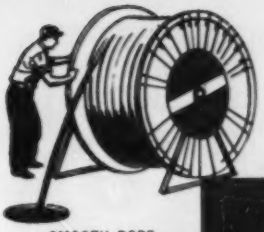
PITTSBURGH REFLECTOR COMPANY

408 OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA—Holden Lighting Manufacturers, Ltd.
15 Yorkville Avenue Toronto, Ontario

DISTRIBUTED BY ELECTRICAL WHOLESALERS EVERYWHERE • PERMAFLECTOR LIGHTING ENGINEERS IN PRINCIPAL CITIES

Call on GRAYBAR to meet greater load requirements



SMOOTH BORE
NO SCORING OR
ABRASION OF SHEATH

EASY TO
INSTALL

EASY TO TOOL

The Happy Combination

CUTS WITH SAW

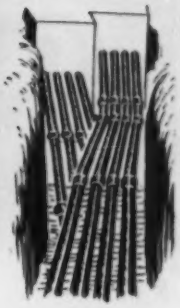
LIGHT - EASY
TO HANDLE

Complete Protection... Long Life... Low Cost

ORANGEBURG
NOCRETE

COMPLETE LINE OF
INTERLOCKING PLASTIC SPACERS

WATER TIGHT JOINTS



ORANGEBURG
STANDARD

HOW does Orangeburg give cables complete protection? It's tough and strong. It's resilient, and "gives" without cracking or breaking. Its walls are impermeable. Its non-metallic material resists acids, alkalies, oil and salt in ground waters. Its joints are watertight. Its smooth bore reduces danger of abrasion.

WHY such low cost? Because Orangeburg is lightweight and easy to install; it lays faster than any other type of conduit . . . saves time and money. The long 8-foot lengths mean fewer joints to make. The Taper Sleeve Joints seal watertight with a few light taps. It lasts indefinitely . . . gives years and years of economical service.

Orangeburg is a leader in every city and state. For data about Fittings, Angle Couplings and Bend Sections, write Dept. EW-65.

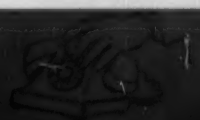
ORANGEBURG MANUFACTURING CO., INC. • **Orangeburg, N. Y.** • **West Coast Plant, Newark, Calif.**

ORANGEBURG
FIBRE CONDUIT

STANDARD INSTALLED WITH CONCRETE

NOCRETE INSTALLED WITHOUT CONCRETE

Call on **GRAYBAR** to meet greater load requirements



EXCEPTIONAL VALUES!

heavy-duty industrial flashlights

- ✓ Positive lock-type switch, replaceable at minimum cost
- ✓ Bakelite switch will not change shape
- ✓ Neoprene end caps absorb shock, resist oils, chemicals, light, and heat
- ✓ Insulated fibre-over-brass barrel

Every detail of these heavy-duty flashlights has been designed with hard, tough usage in mind. Materials have been carefully selected and tested to withstand shocks, contact with deteriorating chemicals, and exposure to light and heat. The end result is a flashlight case which you can specify with confidence, knowing it will give you year after year of satisfactory service . . . reliable "light when you need it" . . . at minimum cost.

NEW Industrial Flashlight Batteries

. . . over 36% more minutes of light

You don't have to guess about the *extra* value in this brand new Ray-O-Vac Battery. Laboratory tests prove the new Ray-O-Vac delivers from 36% to 58% more minutes of useable bright light than four leading competitive makes. Advanced engineering research brings you not only more light, but a battery with patented Ray-O-Vac Sealed-In-Steel construction, top, bottom, and sides. It's guaranteed against corrosion damage to flashlights. It's fresh when you get it, stays fresh in your stockroom—it's not dated! Yet this superior battery costs no more than conventional types. Order now from your nearby Graybar Branch —get prompt delivery on either the new 3LP or the standard 2LP flashlight batteries.

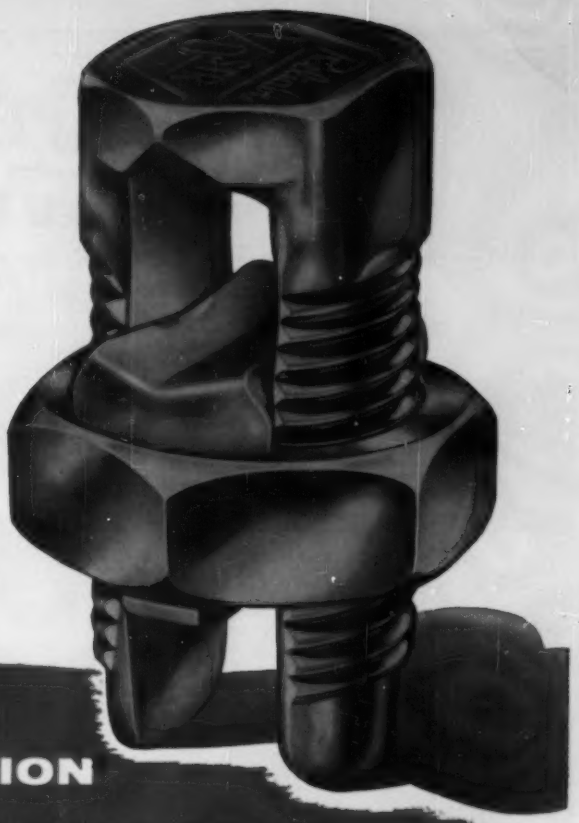
Stock No.	Item	Standard Pack	Unit Pack
3LP	Industrial Cell	192	48
2LP	Standard Cell	192	48

RAY-O-VAC COMPANY, MADISON 10, WISCONSIN

Call on GRAYBAR to meet greater load requirements

Reliable

DESIGNS
CONTROLS
PERFORMS



EVERY OPERATION
IN THE MANUFACTURE OF
SPLIT BOLT CONNECTORS

Forging tools and dies used in making Reliable Split Bolt Connectors are designed, made and maintained by long-experienced Reliable toolmakers.

Critical dimensions are held to close tolerances providing close thread engagement which assures constant pressure on conductors. Continuous inspection with precision tools guarantees that these close tolerances and consequent efficient performance are maintained at all times.

By making and inspecting all threaded parts and contacts in the same plant, Reliable provides Split Bolt Connectors that do a superior job under all conditions.

Reliable Split Bolt Connectors test for pressure, torque and strength well in excess of standards. Reliable cold forged connectors are listed under Re-examination Service, Underwriters' Laboratories.

** BLANK NUT IS PURCHASED, BUT IS THREADED AND INSPECTED BY RELIABLE*

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE
CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

Call on GRAYBAR to meet greater load requirements

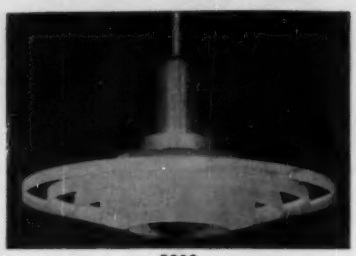
There's a

SKYLIKE® — SILVRAY FIXTURE

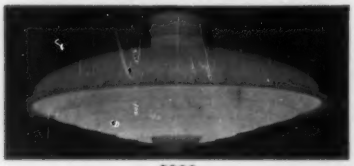
for every

Lighting Application

3500



5500



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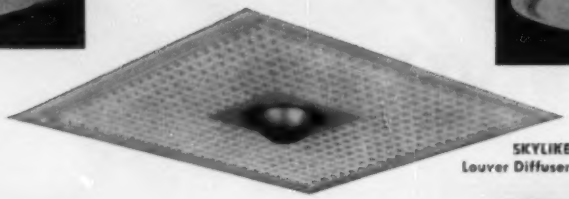
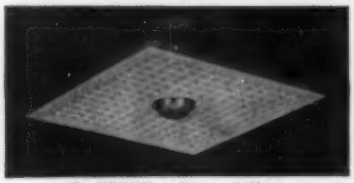


SKYLIKE
Louver Diffuser



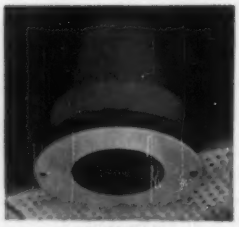
JR. SKYLIKE • Louver Diffuser

FOR USE WITH

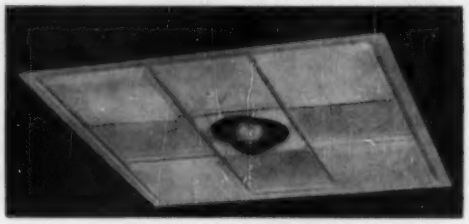
SILVERED BOWL INCANDESCENT LAMPS

JR. SKYLIKE • Plastic Diffuser

Skylike—Silvray fixtures are engineer-designed to provide every requirement of efficient, economical lighting—plus appearance that harmonizes with, and becomes a part of, any architectural scheme. There are correct units for every application—Commercial, Industrial, Residential, Schools, Institutions, etc. See the Skylike-Silvray line before you make any decisions.



SILVER-DOT



SKYLIKE • Plastic Diffuser

SILVER-SPOT

Complete and factual data on any of the units illustrated is available on request. Just send a post card to...

OFFICE
RKO BUILDING
Radio City, N. Y.

SKYLIKE LIGHTING, INC.
A SILVRAY ASSOCIATED COMPANY

FACTORY
BOUND BROOK
New Jersey

Call on GRAYBAR to meet greater load requirements

For Safety's Sake

A DEVICE FOR EVERY ELECTRICAL HAZARD

SALISBURY

RUBBER PROTECTIVE DEVICES

for Linemen

. . . Approved by safety engineers from coast to coast . . . Adopted for safety by public utility companies everywhere . . . Designed for maximum dependability and convenience in use . . . Made from highest grade materials by the pioneers in manufacture of rubber protective equipment for linemen . . . Send for our Utility Catalog.

W. H. SALISBURY & CO.

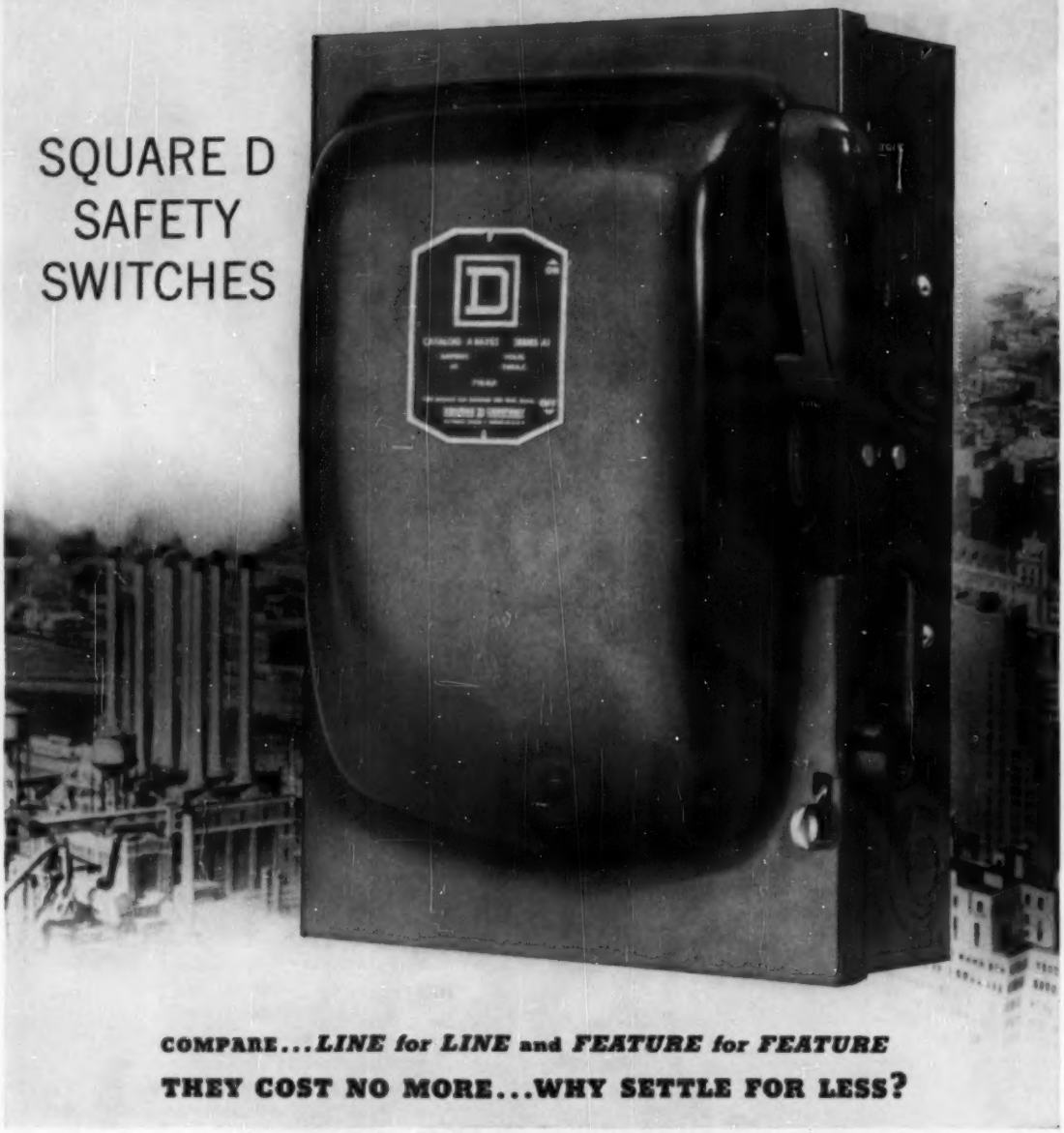
GENERAL OFFICE AND FACTORY

MORGAN & KINZIE STS. CHICAGO 22, ILLINOIS

Call on GRAYBAR to meet greater load requirements

First choice for 50 years

SQUARE D
SAFETY
SWITCHES



COMPARE...*LINE for LINE* and *FEATURE for FEATURE*

THEY COST NO MORE...WHY SETTLE FOR LESS?

SAFETY SWITCHES and other Square D Products are distributed by GRAYBAR

SQUARE D COMPANY

Call on GRAYBAR to meet greater load requirements

How Simplex-TIREX Cords reduce maintenance costs...

When electric cords on portable maintenance tools, such as drills, saws, grinders and polishers, show signs of excess wear or inability to withstand abuse, they need special handling. That means slowing up the work.

Portable tools powered through TIREX Cords are ready to be used any time, any place. Ordinary rough treatment has little or no effect on the life of these tire-like cords.

TIREX Cords have the toughest jacket known. TIREX will not snag or tear. It resists oil, heat and sunlight.

Detergents won't hurt its cured-in-lead Selenium Neoprene Armor.

TIREX is as flexible as a piece of string.

Get TIREX Cords from your local electrical wholesaler. See how they meet your needs, how they help to keep your operation costs down.

Most Graybar houses have TIREX Cords in stock, or can get them for you quickly. Be sure you get TIREX.

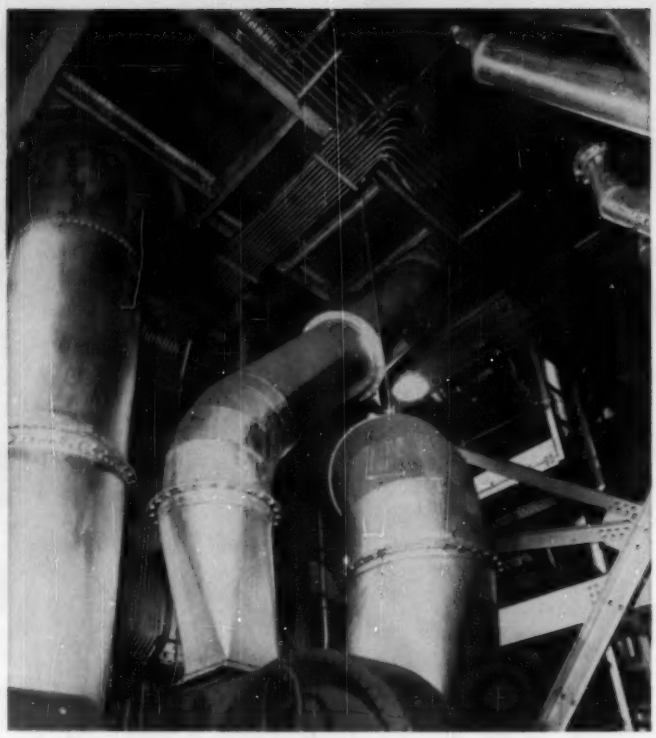
Simplex WIRES & CABLES

TIREX CORDS AND CABLES *are made only by the*

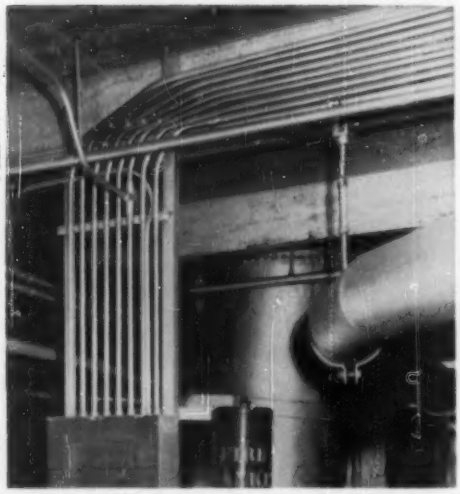
SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

Call on GRAYBAR to meet greater load requirements

25 YEARS and still going strong



There's no need to turn long runs of Republic E.M.T. Strong, compression fittings give lasting joints. And every coupling, every fitting, every panel or box connection is a union.



ELECTRUNITE E.M.T. can be installed in cramped spaces around beams, girders and other obstructions with no difficulty. Uniform ductility permits smooth multiple bending without wrinkling.

When the Cleveland Electric Illuminating Co. built its Ashtabula Power Plant nearly 25 years ago, a lot of Republic ELECTRUNITE E.M.T. was installed. Today, this E.M.T. is still giving efficient, trouble-free service —with no end in sight.

Long-lasting dependability is one big reason why public utilities with a reputation for service consider Republic Electrical Metallic Tubing a good investment —and continue to use it in new installations.

Republic E.M.T. is the original lightweight, threadless rigid steel electrical raceway. Since threading is not necessary, the galvanized zinc coating is unbroken—providing end-to-end circuit protection against moisture, fire and mechanical injury.

It's easy to bend, too. Uniform ductility throughout every length makes possible 90° bends, with smooth and unwrinkled surfaces inside and out. Exclusive "Inch-Marks" and "Guide-Lines"—plus its light weight —help keep installation costs down.

This is just part of the story. If you're building, remodeling or expanding, get all the facts on Republic E.M.T. It's produced to A.S.A. Specification C80.3, approved by Underwriters' Laboratories. Write for Booklet SA-55.

REPUBLIC STEEL

STEEL AND TUBES DIVISION • 213 E. 131st STREET • CLEVELAND 8, OHIO

World's Widest Range of Standard Steels and Steel Products

Made by the producers of ELECTRUNITE . . . The Original Electric Welded Boiler Tube

Call on GRAYBAR to meet greater load requirements

AUDIBLE SIGNAL EFFICIENCY YOU CAN ACTUALLY *See!*

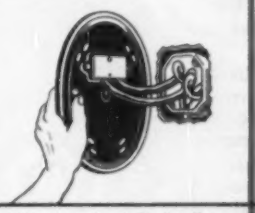
and Hear!

SAFER, EASIER TO INSTALL AND CHANGE

One adapter plate fits horns, buzzers, bells or chimes . . . makes installation *easy* . . . when noise levels demand a new type signal. Safety too . . . Uni-Pact signals are built with electrically dead front adapter plate . . .

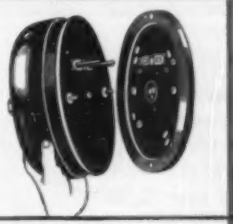
NO EXPOSED TERMINALS

Wire to Back of Dead Front Adapter Plate

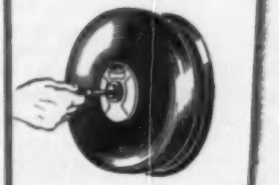


Fits Standard Outlet Box, Wiremold or Condulet

Secure Adapter Plate to Box or Fitting



Plug Uni-Pact Signal Into Adapter Plate



Tighten Fastenings

LOUD ENOUGH FOR EVERY INSTALLATION

There's an *interchangeable* Uni-Pact bell, buzzer, horn or chime for *every* location—regardless of noise levels.

The Uni-Pact is an example of the advanced design features found in *every* Faraday product. See for yourself, whether you are interested in signals or a system for hospitals, schools, commercial or industrial applications.

When you build or modernize . . . install a signal system that offers everything . . . a system that has been designed, engineered and manufactured *entirely* by Faraday. Write for descriptive literature.

Sperti Faraday Inc.

ADRIAN, MICH.

Sperti Faraday of Canada, Ltd., Montreal, Quebec

BUILDERS OF BETTER SIGNALS AND SYSTEMS . . . SINCE 1875

Call on GRAYBAR to meet greater load requirements

Introduced only a few weeks ago, Triangle E. M. T. with the new "Silver" inside finish has already won the acclaim of hundreds of contractors, engineers, electricians and maintenance men. Those who have seen or tried this new E. M. T. are specifying it. Already, many orders are marked: "E. M. T. with new 'Silver' inside finish."

This new "Silver" finish on the *inside* of all Triangle E. M. T. makes a hard, smooth, clean raceway—a raceway that not only makes wire-pulling much easier but gives unprecedented protection against the ravages of moisture, chemicals, oils, greases and fumes.

It's completely new! It's different! Ask your distributor about Triangle's new E. M. T. with the "Silver" inside finish. It costs no more than ordinary E. M. T.

It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, N. J.

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

PLANTS—NEW BRUNSWICK, N. J.: WIRE AND CABLE PLANT • ROD MILL • BRASS AND COPPER TUBE MILL • PLASTIC PIPE PLANT • MOUNDSVILLE, W. VA.: CONDUIT PLANT

WAREHOUSES—BOSTON • CHARLOTTE • CHICAGO • LOS ANGELES • SAN FRANCISCO

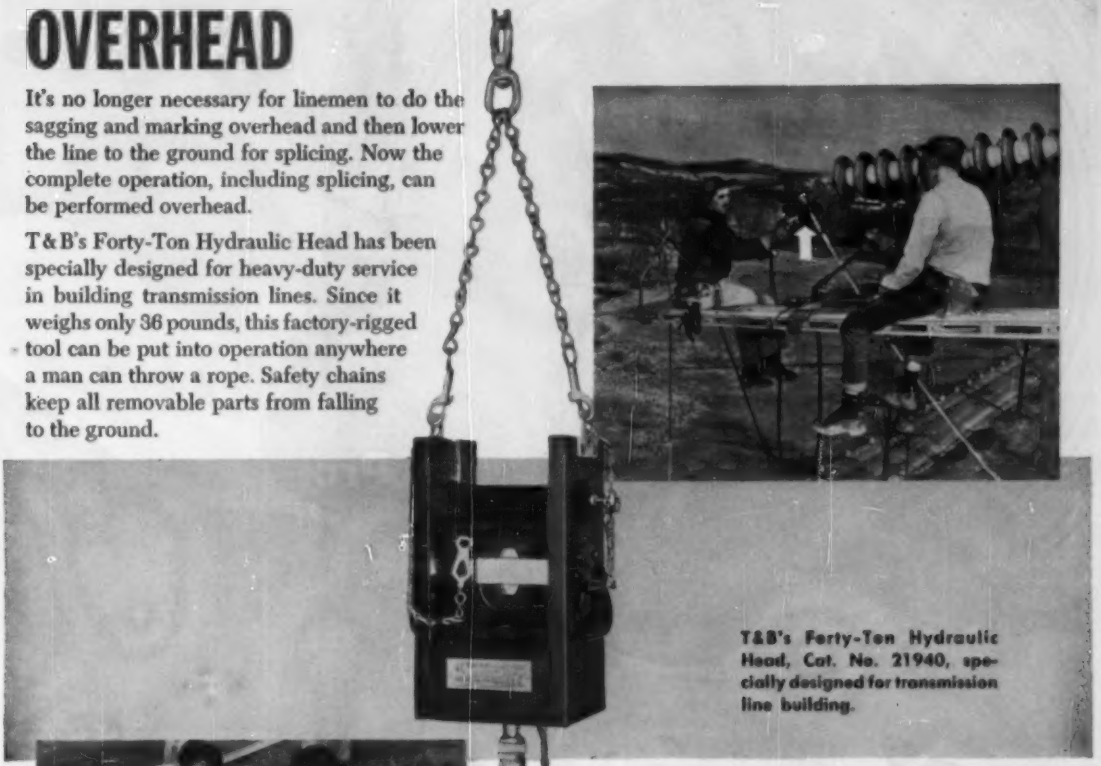
Call on GRAYBAR to meet greater load requirements

Now *ONE* portable tool makes transmission line splices

OVERHEAD

It's no longer necessary for linemen to do the sagging and marking overhead and then lower the line to the ground for splicing. Now the complete operation, including splicing, can be performed overhead.

T&B's Forty-Ton Hydraulic Head has been specially designed for heavy-duty service in building transmission lines. Since it weighs only 36 pounds, this factory-rigged tool can be put into operation anywhere a man can throw a rope. Safety chains keep all removable parts from falling to the ground.



T&B's Forty-Ton Hydraulic Head, Cat. No. 21940, specially designed for transmission line building.

or ON THE GROUND

Demountable legs hold T&B's Forty-Ton Hydraulic Head at convenient working height when installations are being made on the ground. During operation, hardened steel dies compress fitting and cable hexagonally into one homogeneous mass . . . all in a few seconds. The same die set installs tension splicers, dead ends, loop splicers and taps, tees and terminals.

Modern hydraulic design has virtually eliminated the need for maintenance. However, field maintenance is simple and practical. The 21940 Installing Head can be completely disassembled and reassembled in less than one-half hour with these common tools: screw driver, Allen wrench, and mallet.

T&B Bulletin 70 gives a detailed description of the Forty-Ton Hydraulic Head as well as complete lines of T&B connectors, tools, and accessories for transmission line building. Send for FREE copy.

LOOK FOR THIS SIGN — T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T&B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-418

THE THOMAS & BETTS CO.

INCORPORATED

14 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

Call on GRAYBAR to meet greater load requirements

How many holes will it drill?

Thor

out-performs them all
in the REAL TEST
of an Electric Drill!

Powerful, compact, easy to handle, Thor electric drills show *immediate results* in substantial time and money savings on any job . . . the BONUS you get, when you specify Thor, consists of the many exclusive built-in mechanical and electrical advantages that combat tool failure and add tremendously to the life of the tool! Prove it in your own plant! Thor Electric Drills are recommended, stocked and sold by leading industrial supply distributors everywhere!

Featuring

- *All* ball-bearing construction . . . no skimping.
- Machined gears of tough, wear-resistant high carbon alloy steel.
- Electronically balanced motors.
- Triple insulated windings.
- Super-thin *oxidized* laminations.
- Flexible armature leads staked and soldered to commutator bars.
- Die-cast super-strength aluminum housings.
- Cast-in bearing inserts.
- Precision-machined housings for lifetime alignment.
- Bridged construction supports upper armature bearing integral with main housing.
- Chucks seat on precision ground shoulders for lifetime concentricity.

40 MODERN MODELS
Capacities ¼" to 1½" Holes

THOR POWER TOOL COMPANY
AURORA, ILLINOIS

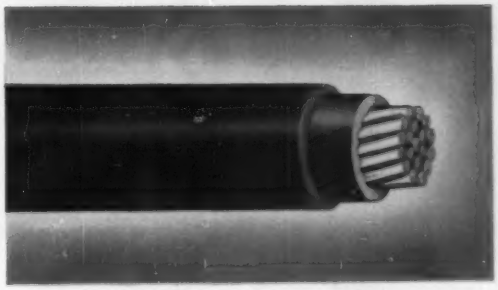
IMPACT WRENCHES • SCREWDRIVERS • NUT SETTERS • SAWS • GRINDERS • HAMMERS • SANDERS

Call on GRAYBAR to meet greater load requirements

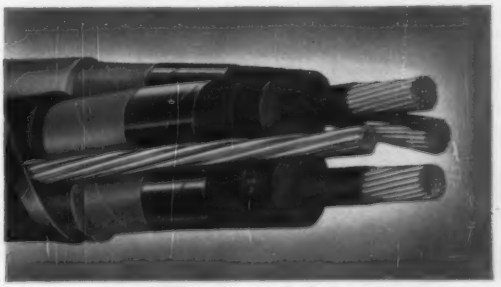
10 reasons why

you should specify, buy,

install U. S. GRIZZLY® POWER CABLES



U. S. Grizzly Power Cable, 600 volts – Type RR single conductor, Hydrosec® – S heat- and moisture-resistant insulation, Neoprene jacket.



U. S. Grizzly Power Cable, 15,000 volts – Type RR – 3-conductor, Uskorona® – ozone-resistant insulation – shielded – Neoprene jacket.

1. Lighter in weight than lead-sheathed cables and lead-sheathed armored cables.
2. Greater flexibility
3. Easier to handle during installation
4. Easier to splice, tap and terminate
5. More resistant to chemical corrosion
6. Unaffected by stray currents
7. Better protection against weathering
8. Longer life
9. Cost less
10. Made by United States Rubber Company, the *only* electrical wire and cable producer to grow its own natural rubber, make its own synthetic rubber and manufacture its own plastics

U. S. Grizzly Power Cables are used for general power distribution, and can be installed in conduits, underground ducts, buried directly in the ground, or installed aerially. Neoprene jacket protects against acids, alkalies, oils, and mechanical damage and weathering. (All IPCEA and NEMA specifications complied with.)

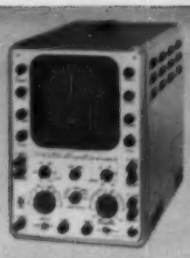
Write to address below for free copy of illustrated reference manual on U. S. Electrical Wires and Cables for the electric utility industry. It lists the type of cable best suited for specific requirements.

US RUBBER

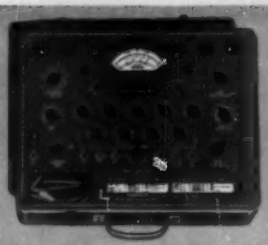
UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE AND CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

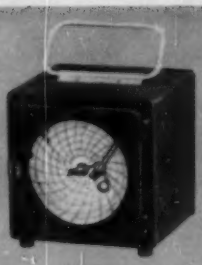
Call on GRAYBAR to meet greater load requirements



Weston OSCILLOSCOPE (Model 983)
—a high gain, wide band scope with identical amplifiers, ideal for phase measurements, frequency comparisons, and *all-purpose* visual wave form analysis. Choice of a-c or d-c coupling—excellent square wave reproduction, overshoot 2 to 5%—rise time 0.1 microsecond. Sensitivity (both amplifiers) 19 millivolts per inch RMS—band pass characteristics within 3 db at 4.5 megacycles.



Weston TUBECHECKER (Model 981)
—standard throughout industry since 1926. Filtered d-c potentials provide better Gm accuracy. Voltage divider network for better grid bias settings. The four signal levels provided protect against excessive grid current surges. Provision for tube interelectrode leakage measurements as high as 10 megohms.



Weston Miniature ELECTRICAL RECORDER (Model 6401)
—ideal for recording current variations—monitoring radio detectors—recording speeds—making life tests on batteries, lamps, etc. Employs Cormag® self-shielded mechanism—size only 6¾"x6¼"x7"—chart size 4" dia. Available in required ranges for a-c or d-c voltage or current measurements.

Specialized Instruments..

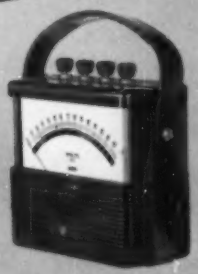
—to do important electronic and electrical measurement jobs *better, quicker, at lower cost*

Literature on these and other Weston instruments for production, laboratory or maintenance needs, gladly sent on request.

WESTON
Instruments

WESTON ELECTRICAL INSTRUMENT CORPORATION
614 Frelinghuysen Avenue, Newark 5, New Jersey

Weston 1301 Line Panel Instruments
—a new line of 3½" panel instruments employing the CORMAG® self-shielded mechanism, which provides added dependability and substantial cost-savings on built-in requirements. Instruments can be mounted on magnetic or non-magnetic panels interchangeably, and there is no magnetic intereffect when mounted in close proximity.



Weston Precision Portables (Model 901)
—provide unequalled scale visibility due to wrap-around windows, efficient shielding, accuracy of 0.5%. Available as d-c voltmeters, volt-ammeters, ammeters and milliammeters—a-c single and 8 range voltmeters, single and 7 range ammeters, milliammeters—also a-c and d-c single phase wattmeters.

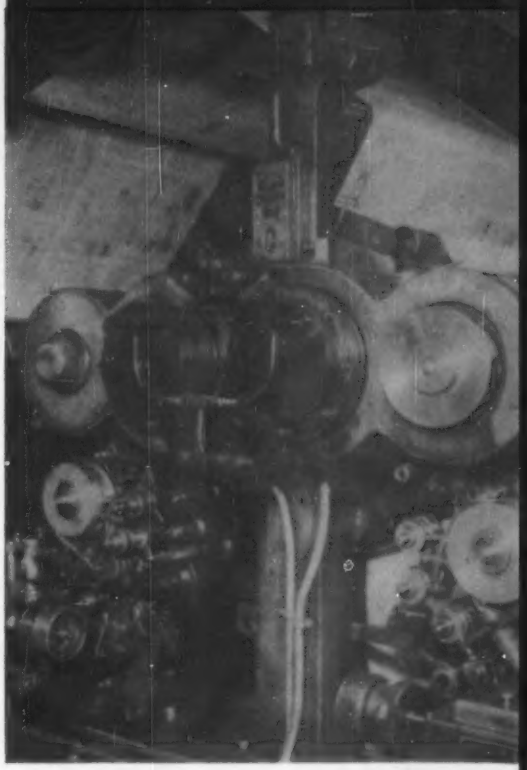
Weston All-Purpose ANALYZER (Model 980)
—a versatile, rugged instrument with a combination of functional ranges to cover a wide range of test measurement needs. D-c sensitivity 20,000 ohms/volt, a-c sensitivity 1000 ohms/volt. Range and functional switching greatly simplified by use of a single dial. Accuracy 2% d-c; 3% a-c. Scale length 4.63"—size 6¼"x7½"x3¼".

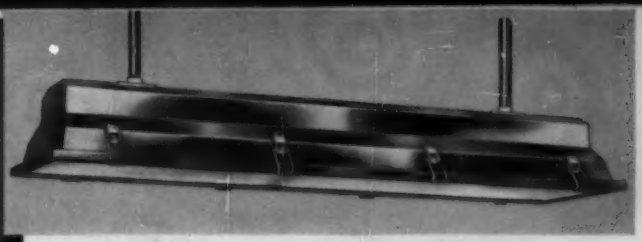
Weston Miniature CLAMP VOLT-AMMETER (Model 749)
—light weight, pocket size, and really rugged. Employs CORMAG® self-shielded, shock-mounted mechanism. Shatter-proof Plexiglas window. One scale for all ranges and functions. Jaws take up to 1" round or 1¾" rectangular conductors. Ranges—current: 300/150/60/30/15/6 amperes a-c...voltage: 600/300/150 volts a-c.

Call on GRAYBAR to meet greater load requirements

engineered lighting

for hazardous and specialized locations





Wheeler VAPOR TIGHT

These specialized Wheeler fixtures combine superior lighting efficiency with extraordinary resistance to moisture and vapors. Insurance against costly product spoilage from lamp breakage or falling lamps is provided by the heavy cover furnished with each of these carefully engineered units. Equipped with plain clear glass, or with tempered plate glass where required to withstand shocks and impacts.

USES

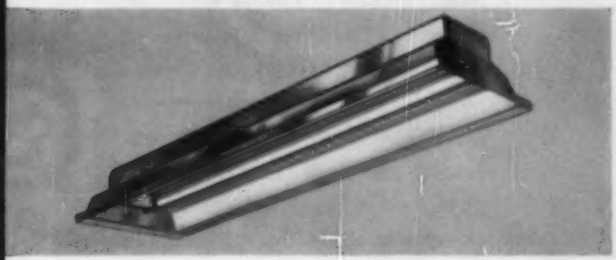
- PRESS ROOMS
- FOOD PLANTS
- LAUNDRIES
- MEAT PACKERS
- DYE HOUSES
- CAR WASH GARAGES
- BOTTLING PLANTS

Wheeler "SERIES II" DUST-TIGHT

Fully comply with all Underwriters' requirements for installation in Class II, Group G, Class II, Group F and Class III locations. These hazardous locations involve the presence of atmospheres containing combustible dusts or ignitable fibers or flyings.

USES

- GRAIN ELEVATORS
- SUGAR MILLS
- WOOD-WORKING PLANTS
- WAREHOUSES
- BOILER ROOMS
- MINES



Wheeler TEXTILUME

One-piece construction and seamless porcelain enamel finish makes these specially designed units ideal for textile mills or any other industry where severe moisture and humidity conditions exist. Engineered for long, trouble-free service. Accessory glass covers available.

USES

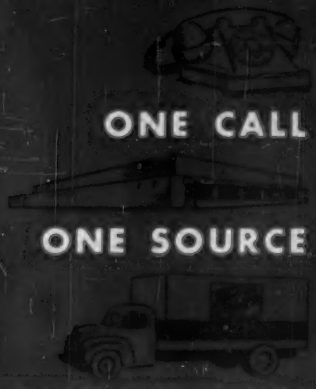
- TEXTILE MILLS
- PAPER MILLS
- TANNERIES
- RUBBER PLANTS
- DAIRIES

Wheeler / REFLECTOR COMPANY

275 Congress Street • Boston, Mass.

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Call on GRAYBAR to meet greater load requirements



ONE CALL

ONE SOURCE

ONE RESPONSIBILITY

. . . and there's a Graybar office or warehouse *near* you!

Local stocks of standard electrical items and fast delivery of non-stock lines assure on-schedule deliveries when you order 100% via Graybar. There's a minimum of paper work involved and there's no problem in co-ordinating deliveries from numerous widely separated suppliers. Check the list at right for the Graybar office or warehouse nearest you, then make it a point to *call Graybar first!*

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Mobile

ARIZONA
Phoenix
†Tucson

ARKANSAS
Little Rock

CALIFORNIA
Fresno
Long Beach
Los Angeles
Oakland
Sacramento
San Bernardino
San Diego
San Francisco
†Santa Ana

COLORADO
Denver

CONNECTICUT
New Haven
West Hartford

DELAWARE
Wilmington

DIST. OF COLUMBIA
Washington

FLORIDA
†Fort Lauderdale
Jacksonville
Miami
Orlando
†St. Petersburg
Tampa

GEORGIA
Atlanta
Savannah

IDAHO
Boise

ILLINOIS
Chicago
Peoria
Springfield

INDIANA
Evansville
Hammond
Indianapolis

IOWA
Davenport
Des Moines
Sioux City

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New Orleans
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MAINE
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WISCONSIN
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GraybaR Everything Electrical

GraybaR ELECTRIC CO., INC., Executive Offices: Graybar Building, New York 17, N. Y.

IN OVER 120 PRINCIPAL CITIES

Shipments, Orders and Open Manufacturing Capacity for Electrical Equipment, 1954–1958

Total Capacity Shipped and on Order and Scheduled for Shipment	Shipped 1954	Shipped First 3 Months of 1955	On Order as of April 1, 1955: Last 9 Months of 1955	1955	1956	1957	1958 and Later	Total Scheduled for Shipment as of 4-1-55	New Capacity Scheduled 10-1-54 to 4-1-55	Capacity Shipped 10-1-54 to 4-1-55
LARGE STEAM TURBINE-GENERATORS[3] (10,000 Kw and Larger)[4]										
U. S. El Pr Syst[1]	10,862,700	2,536,500	6,743,500	9,280,000	6,313,500	6,710,000	2,005,200	21,772,200	9,074,500	6,010,300
U. S. Industrials	428,100	110,000	53,100	73,100	343,700	60,000	.....	456,800	294,400	48,200
Outside U. S.	453,100	44,000	441,100	485,100	922,000	30,000	.....	1,413,100	684,500	216,700
TOTAL	**11,743,900**	**2,690,500**	**7,237,700**	**9,838,200**	**7,579,200**	**6,810,000**	**2,005,200**	**23,642,100**	**10,053,100**	**6,275,200**
Est. Open Capacity[2]	.....	.....	.....	.....	2,000,000	7,600,000	12,500,000			
SMALL STEAM TURBINE-GENERATORS[3] (4,000 to 9,999 Kw)[4]										
U. S. El Pr Syst[1]	84,400	9,400	81,200	90,600	13,700	9,400	.....	104,300	57,500	40,700
U. S. Industrials	171,600	15,600	94,600	110,200	.....	21,200	.....	115,800	80,200	55,500
Outside U. S.	108,100	23,100	42,700	65,800	.....	.....	.....	42,700	27,700	56,800
TOTAL	**364,100**	**48,100**	**218,500**	**266,600**	**13,700**	**30,600**	.....	**262,800**	**165,400**	**153,000**
Est. Open Capacity[2]	.....	.....	.....	.....	1,100,000	1,400,000	1,400,000			
STEAM GENERATORS (450 Psi Pressure and Higher)[5]										
U. S. El Pr Syst[1]	76,818	10,405	36,806	47,211	38,901	6,905	.....	82,612	34,684	25,438
U. S. Industrials	14,297	1,473	6,551	8,024	450	.....	.....	7,001	5,170	3,678
Outside U. S.	7,682	1,385	5,540	6,925	4,085	.....	.....	9,685	6,105	4,617
TOTAL	**98,797**	**13,263**	**48,897**	**62,160**	**43,436**	**6,905**	.....	**99,238**	**45,959**	**33,733**
Est. Open Capacity[2]	.....	.....	.....	10,000	97,000	137,000	145,000			
STEAM GENERATORS (450 Psi Pressure and Higher)[6]										
U. S. El Pr Syst[1]	.....	12,367	43,385	55,752	45,733	8,160	.....	97,278	.....	.....
U. S. Industrials	.....	1,604	7,894	9,498	519	.....	.....	8,413	.....	.....
Outside U. S.	.....	1,564	6,301	7,865	4,806	.....	.....	11,107	.....	.....
TOTAL	.....	**15,535**	**57,580**	**73,115**	**51,058**	**8,160**	.....	**116,798**	.....	.....
WATER-WHEEL GENERATORS[7] (4,000 Kw and Larger)[4]										
U. S. El Pr. Syst[1]	1,408,000	255,000	1,048,200	1,303,200	647,800	542,000	861,000	3,099,000	1,669,000	475,800
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	184,000	75,200	147,600	222,800	20,700	.....	.....	168,300	33,700	106,900
TOTAL	**1,592,000**	**330,200**	**1,195,800**	**1,526,000**	**668,500**	**542,000**	**861,000**	**3,267,300**	**1,702,700**	**582,700**
Est. Open Capacity[2]	.....	.....	.....	.....	1,600,000	2,300,000	2,300,000			
HYDRAULIC TURBINES (5,000 Hp and Larger)[8]										
U. S. El Pr Syst[1]	3,148,900	705,900	1,629,600	2,328,500	805,900	1,127,200	1,112,800	4,665,500	1,387,400	1,696,900
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	67,000	18,800	113,300	132,100	.....	.....	.....	113,300	12,500	18,800
TOTAL	**3,215,900**	**724,700**	**1,735,900**	**2,460,600**	**805,900**	**1,127,200**	**1,112,800**	**4,778,800**	**1,399,900**	**1,715,700**
Est. Open Capacity[2]	.....	.....	.....	.....	2,000,000	3,300,000	3,600,000			
POWER TRANSFORMERS (501 Kva and Larger)[9]										
U. S. El Pr Syst[1] and Industrials	58,373,000	11,076,000	28,162,000	39,238,000	11,895,000	3,376,000	47,000	43,680,000	24,120,000	25,441,000
Outside U. S.	1,233,000	425,000	1,043,000	1,468,000	64,000	.....	.....	1,107,000	13,000	661,000
TOTAL	**59,606,000**	**11,501,000**	**29,205,000**	**40,706,000**	**11,959,000**	**3,376,000**	**47,000**	**44,787,000**	**24,133,000**	**26,102,000**
Est. Open Capacity[2]	.....	.....	.....	27,000,000	63,000,000	71,000,000	75,000,000			

[1] U. S. Electric Power Systems.
[2] Estimated open manufacturing capacity for production of additional units.
[3] Manufacturers' maximum rated capability.
[4] Figures in kilowatts.
[5] Figures in 1,000 lb steam per hr.
[6] Figures in heat output, millions Btu per hr.
[7] Manufacturers' rating of generators.
[8] Figures in horsepower.
[9] Figures in kilovolt-amperes.

First Quarter Orders Top 9 Million Kw . . .

. . . on heels of record shipment in 1954 of 13.7 million kw of generating capacity, latest EEI Power Survey shows

• First quarter of 1955 was a record period for orders placed for electric generating units, totalling 9.1 million kw.

• Total shipments of thermal and hydraulic generating capacity amounted to 13.7 million kw in 1954—highest in history, exceeding a previous record attained in 1953 by almost 700,000 kw.

• First time a 300,000-kw generator is included; this is the Detroit Edison Co unit ordered in 1954.

• First atomic reactor power project to be included in an Edison Electric Institute Semi-annual Survey; this is the 60,000-kw unit for Duquesne Light Co scheduled for operation in 1958.

• First time an EEI survey includes ratings of steam generators by heat output (millions Btu per hr).

The foregoing five items are some of the high points in the 17th Semi-annual Electric Power Survey prepared by EEI.

This EEI survey covers steam turbine-generators, steam generators, water-wheel generators, hydraulic turbines, and power transformers. It presents information, as of April 1, 1955, relative to shipments, scheduled production and estimated open manufacturing capacities for 1954 through 1958. Data was furnished by 19 of the country's leading manufacturers of heavy electric power equipment. Steam turbine-generator data are based on manufacturer's maximum rated capability and the other equipments on nameplate ratings.

Two atomic power reactors for U. S. electric power systems were on order on April 1, 1955. They are for steam generation in new thermal power projects having a combined capacity of approximately 300,000 kw. One reactor is for the 60,000-kw Du-

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Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

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Greater Safety and Efficiency

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A sturdy efficient tool designed for handling poles, piling and timber, made of high tensile steel; opened by trip line. Compression on object is 38% of its weight.

TWO SIZES

11½" opening. 16½" opening.

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Long Beach California

quesne unit, the other is for the 236,000-kw installation planned by Consolidated Edison Co. For the latter the generator had not been ordered by April 1.

Production . . . Thermal and hydraulic electric generating equipment (4,000-kw and larger) scheduled for U. S. electric utilities in 1955 totals almost 10,674,000 kw. About 26% was shipped in the first three months.

Scheduled production of waterwheel generators in 1955 totals 1,303,200 kw, and for 1956 is 647,800 kw.

Scheduled production for thermal and hydraulic generating capacity for U. S. utilities in 1956 (based on April 1 data) totals about 6,975,000 kw, in 1958, and later, about 2,866,200 kw.

An increase in manufacturing capacity has resulted from improved facilities and from continued trend toward larger capacity units.

Shipments . . . Changes in scheduled shipments of 10,000 kw and larger steam turbine-generators during the past six months have resulted in a slightly lower scheduled production for 1955 than in the previous survey.

For hydraulic turbines, the total scheduled for shipment as of April 1 was 3,099,00 kw or about 1,183,000 kw more than was scheduled on October 1, 1954.

New Orders . . . New Capacity ordered during the six-month period

(*Continued on next page*)

Bishop Research Produces New Tape

Bishop Manufacturing Corp of Cedar Grove, N. J., has embarked on an extensive research and development program which has already resulted in the marketing of Bishop No. 30—a high-voltage ozone and corona-resistant splicing tape. This tape is designed for use on power cables rated from 2 to 15 kv, inclusive, and at conductor temperature ratings of 85 C.

In developing Bishop No. 30, the company based its program on splicing requirements deemed necessary by cable manufacturers, power company engineers and splicing specialists. The result is a splicing tape that fuses into a homogeneous moisture-proof wall.

To illustrate the performance characteristics of Bishop No. 30, laboratory tests comparable to severe operating conditions have been conducted. Heat-aging tests over extended periods, as shown in the illustration, exhibit a high order of retention of the original properties.

Development of Bishop No. 30 is an addition to the company's line of splicing mediums for the electrical power and communications industries. Bishop also manufactures Bi-Seal self-bonding electrical tape; two thicknesses of vinyl electrical tape, No. 1 & No. 2; No. 125 electrical filler tape, and Bi-Prene, neoprene electrical jacketing tapes.

EEI Survey

(*Continued from previous page*)

ending April 1 was reported to be about three times the amount ordered during the previous six-month period.

For large steam turbine-generators for U. S. electric utilities, new orders placed during the past six months totalled about 9 million kw and exceeded production during the same period by 60%.

The capacity of water-wheel generators placed on order during the past six months exceeded that ordered during the previous 2.5 year period. Practically all of this capacity is for U. S. Electric utilities.

The record indicates that, on April 1, approximately 4.7 million kw of new generating capacity was on order for U. S. electric utilities for which steam generators had not been ordered. Boilers are often ordered about 6 months after the electric units probably because of the shorter manufacturing cycle for the steam generating units.

M&M BRIEFS

Daystrom, Inc, of Elizabeth, N. J., has received an initial order from the Atomic Energy Commission for 20 instruments to measure and control atomic energy. They will be used with the Geneva reactor to be built in conjunction with the UNESCO "Atoms for Peace" meeting in Geneva, Switzerland, this summer.

Eagle Electric Mfg Co is celebrating its 35th year as a producer of electrical components and appliances.

E. I. Du Pont de Nemours and Co, Inc, reports that its employees set a new company safety record of 0.33 lost-time injuries per million manhours in 1954. This was more than 15 times as safe on the job as away from work.

Westinghouse Electric International Co will supply twelve 7,000 hp combustion gas turbines for a large gas repressurizing plant being built by Creole Petroleum Corp 7 miles out on Lake Maracaibo, Venezuela. Turbines will drive centrifugal compressors which will put natural gas derived from oil operations back into the oil pool to force more oil to the surface.

SALES ASSIGNMENTS

Company Staffs

Leeds & Northrup Co has named Donald E. Moat assistant director of marketing. He was formerly district sales manager in the company's Cleveland office and will be acting head of the marketing department in Philadelphia, Pa., succeeding the late L. E. Emerich.

General Electric Co has made the following appointments: Thomas F. Skinner, manager of the user industries sales department, Apparatus Sales Division, Mid-States District with headquarters in St. Louis, Mo.; John J. Miller, Mid-States District manager of GE Apparatus Sales Division's component and intermediate distribution sales department in St. Louis; R. F. Parker, manager of carbide component sales for the carboloy department in Detroit; Edmund K. Nock, supervisor of land sales of GE's medium steam turbine, generator, and gas department; Jerome T. Coe, sales manager for the silicone products department, and G. E. Lewis, manager of radar and precipitation transformer sales.

Westinghouse Electric Corp has named Allen R. Campbell area sales manager for the Chicago District. Company also named Allan W. Larson as sales manager of the Lighting Division, succeeding E. C. Huerkamp who has been appointed division manager.

Graybar Electric Co, Inc, has made B. R. Lind branch manager at Madison, Wisc. Company has appointed J. T. Young branch manager at Evansville, Ind. J. R. Harlan will succeed Young as branch manager at Portsmouth, Ohio.

Pittsburgh Reflector Co has appointed Charles R. Shapard lighting representative for the western Tennessee, eastern Arkansas, and northern Mississippi territory.

Representatives

Osgood and Associates, 988 Spring St., N. W., Atlanta, Ga., has been formed by Richard Hoe Osgood and his son, Richard Hoe Osgood, Jr. The firm will cover Nashville, east Tennessee, South Carolina, Georgia, Florida, and Alabama area. It will represent the following companies: Delta Star; Howard Electric Division of the Howard Foundry Co; Gates Engineering Co; Johnson-March Corp; Kerite and Roller-Smith and Behr Manning.

Edison Cooling Systems, Inc, has been franchised by the General Electric Co to handle Weathertron heat pump sales and service in Manhattan, Bronx, and the lower part of Westchester County in New York.

Austin Ford Logan, Inc, Buffalo, N. Y., has been named Carboloy coal mining tool distributor by the Carboloy department of the General Electric Co.

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Your local G-E Service Shop uses mass-production methods when it rebuilds your old distribution transformers. Result: high-quality work at low cost . . . prompt pickup and delivery . . . and no worries for you. And you get new-unit warranties! There are 31 G-E Service Shops throughout the country—one near you. 451-52

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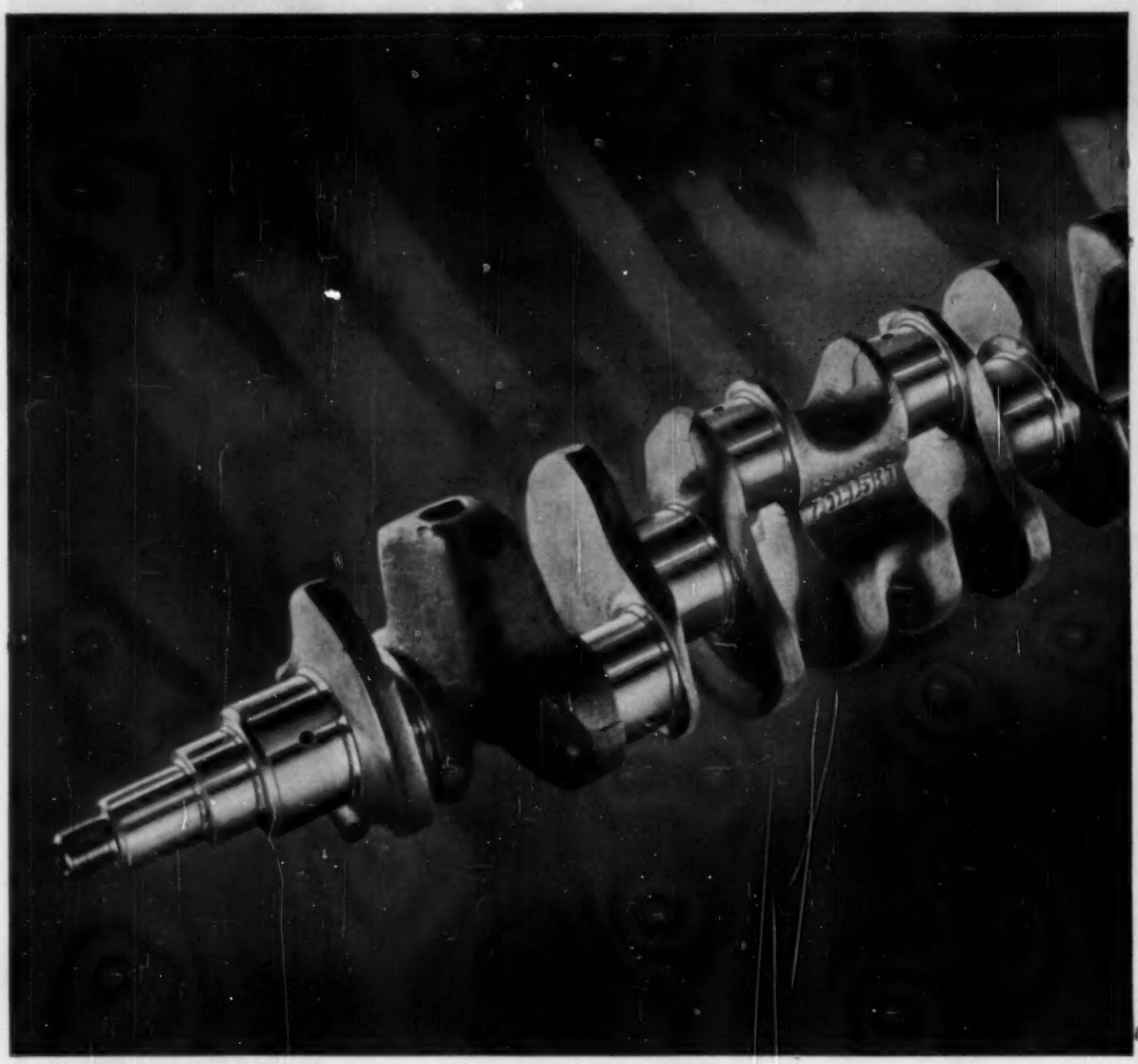
A truck engine needs



From fiery forges and precision machines come extra-strong engine crankshafts, built to make the big difference in truck life.

INTERNATIONAL crankshafts are designed and built for truck use. They are heavier than comparable forged or cast alloy designs, but without any "lazy metal." Those used in light-duty models are 17% heavier than the average weight of 6-cylinder crankshafts used in the four other leading light-duty makes—for maximum strength and rigidity, long life.

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a "backbone" like this—

to save you the BIG money

Crankshafts are just one example of INTERNATIONAL all-truck engineering that saves you the *big money*.

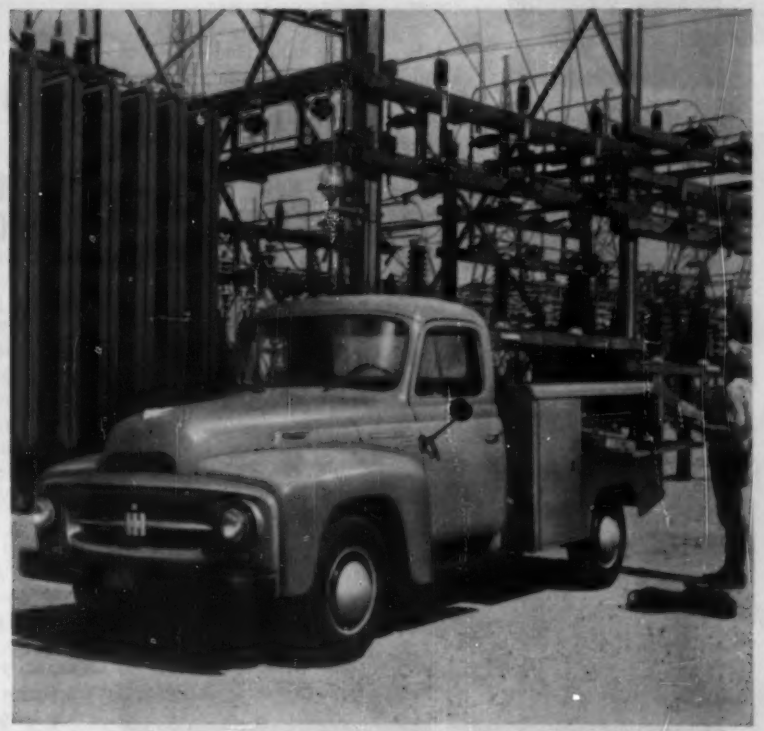
Of the five leading makes, only INTERNATIONAL offers a complete line that is *all-truck built* . . . with no automobile engines or components asked to do a truck job.

You save the most with an INTERNATIONAL that's *all-truck built* to last longer. It earns its keep in lower over-the-years operating and maintenance cost. It pays for itself in use. It saves you—earns you—the *big money*.

Keeping costs down has made INTERNATIONAL the heavy-duty leader for 23 straight years. Let your INTERNATIONAL Dealer or Branch show you the right INTERNATIONAL for your job—built to save you the *BIG* money.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

All-Truck Built to save you the BIG money!



There's an INTERNATIONAL *exactly right* **for every public utility job—***all-truck built* **to save you the** *BIG money*. **9 light-duty models with Service-Utility body and 11 medium-duty chassis from 4,200-16,000 lbs. GVW. Every other truck type. World's widest choice of power and power transmission options.**

Hallingby Elected a VP

PAUL HALLINGBY, JR

Paul Hallingby, Jr, has been elected a vice president of Middle South Utilities, Inc. He has served as assistant to Edgar H. Dixon, president of the company, for the past three years.

After receiving a degree in mechanical engineering from Stanford University in 1941, Hallingby did graduate study at Harvard Business School. He entered the U. S. Navy in 1942 and was released from active duty in 1946 as a lieutenant commander.

After World War II Hallingby entered the field of investment banking. He was associated with First Boston Corp and, later, E. F. Hutton Co, both of New York City.

In 1952 Hallingby joined Middle South Utilities as assistant to the president and continued in that capacity until his recent election as vice president at the age of 35.

G. H. BOURNE

Tippy Becomes President

William B. Tippy, executive vice president and a director of Commonwealth Services, Inc, has been elected president of the management and engineering consulting firm to succeed Granville H. Bourne who has been advanced to the new office of chairman of the board.

An electrical engineering graduate, Tippy worked with Detroit Edison Co, General Electric Co, and Consumers Power Co before he became associated with the predecessor of Commonwealth Services in 1945.

Bourne, in the utility field since 1906, has served Commonwealth since its predecessor's organization in 1929. He was elected president of newly formed Commonwealth in 1947.

W. B. TIPPY

N. J. MACDONALD E. C. HEWITT R. M. THOMAS

MacDonald Advanced

Thomas & Betts Co has named N. J. MacDonald president, Robert McK. Thomas, Jr, general vice president, and Edward C. Hewitt, vice president in charge of sales.

MacDonald joined Thomas & Betts in 1921 as a salesman. Successive promotions to sales manager, director of the company, and vice president in charge of sales culminated in 1944 with his election as general vice president. After World War II he conceived, organized, and carried out the Electrical Interdependence Program.

Since his employment in 1933 Thomas has held the posts of assistant personnel manager, service manager, assistant to the president, manager of manufacturing, and then assistant secretary in 1951.

In his 25 years with the company, Hewitt has been salesman, district manager, assistant sales manager, and was made general sales manager in 1951.

FACTS on Westinghouse 5000-kw gas turbines . . .

Westinghouse gas turbines do these extra jobs

Here's how Westinghouse gas turbines can save you money when used with steam turbines:

- Hot gases exhausted by the gas turbine can heat feedwater. This removes extraction load from the steam turbine, raising its capability.
- Exhaust from gas turbines contains almost as much oxygen as free air so it can be used as preheated combustion air for fuel-fired boilers. The 5000-kw gas turbine can supply enough combustion air for a boiler with a capacity of 400,000 pounds of steam per hour.
- And all this in addition to 5000 kw more capability for your system.

• • •

GET ALL THE FACTS about how gas turbines can work in your steam turbine plant to save money. Call *The Man With The Facts,* your Westinghouse sales engineer, or write for a copy of booklet B-5887, *Westinghouse Gas Turbine Power Plants for Electric Power Generation.* Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

J-50572

GAS TURBINE POWER PLANTS FOR ELECTRIC POWER GENERATION . . . 1250 KW TO 15,000 KW

YOU CAN BE SURE...IF IT'S Westinghouse

T. E. SEELYE

Seelye Appointed President

Theodore E. Seelye has been elected president of Day & Zimmerman, Inc, engineers of Philadelphia, Pa.

He is a native of New Orleans, La., and studied civil engineering at the University of Michigan. He became associated with the Day & Zimmerman organization in 1933 as a vice president.

Previously Seelye had been engaged in engineering with other consulting firms and with the United States Government. He served with the U. S. Army in 1917-19 as a captain and major in the Corps of Engineers. At the termination of the war, he was engaged in the appraisal of war damages for the transportation system of Belgium.

PERSONAL BRIEFS

John E. Hunt has been named purchasing agent by Public Service Electric & Gas Co, succeeding the late Roy S. Rogers. **William Maidment,** division superintendent in the Central Division, electric distribution department, of PSE&G, has retired from the company after 45 years of service.

Robert L. Lagerquist has been appointed supervisor of welfare, claims, and safety for the Connecticut Light & Power Co, succeeding Thomas J. Flanagan who has retired after 46 years of service with the company.

Philadelphia Electric Co has named **Dr William F. Betsch** assistant medical director of the company . . . Ebasco Services, Inc, has appointed **William G. Lauffer** as head of the mechanical betterment group of the consulting engineering department, succeeding the late Arthur H. Krauss.

Lawrence G. Maechtlen of the Square D Co has been elected president of the Electric Club of Los Angeles . . . **Evelyn Brooks,** Wisconsin Electric Power Co, has been named president of the Milwaukee Chapter of the National Secretaries Association (International) . . . **Charles Lingo** of the Florida Power & Light Co has been elected president of the Miami Chapter of the Florida Engineering Society.

Walter M. Gillespie, assistant manager of the Heating Division of Dayton Power & Light Co, has been elected first vice president of the National District Heating Association at the group's 46th annual meeting in Chicago . . . Dayton P&L's **Robert F. Isenhart,** manager of Purchases and Stores Division, has been elected president of Purchasing Agents Association of Dayton . . . Northwest Ohio Municipal Electric Association has elected as president the superintendent of Napoleon Municipal Light & Power Co, **Clayton Kelley . . . A. W. Morgan,** budget director and board member of Toledo Edison Co, has retired after 45 years with utilities.

George E. C. Hayes, first Negro member of the District of Columbia Public Utilities Commission, has been elected chairman of the commission to succeed Robert L. McLaughlin who has resigned . . . **Terry Gunn,** assistant to Manager Walter Harrison of Georgia Electric Membership Corp, a statewide organization, has resigned to become public relations manager for Indiana Statewide Rural Electric Cooperative.

Frank McLaughlin, president of Puget Sound Power & Light Co, has been elected chairman of Puget Sound Utilities Council to succeed **Paul R. Raver,** superintendent of Seattle City Light. H. P. Forman has joined Puget Sound P&L as assistant to President McLaughlin. Forman, until recently information manager of New York Telephone Co, has responsibilities principally in the field of public relations and community development.

William F. Moses, vice president of New Jersey Power & Light Co, has won an Award For Merit, presented annually by Research Institute of America, for his "contribution to executive skills."

OBITUARY

Charles Peter Couch, 64, a brother of the late Harvey C. Couch who founded the Arkansas Power & Light Co, died in Little Rock, Ark., recently. He was formerly vice president and general manager of the Mississippi Power & Light Co.

Thomas J. Seward, 73, died on June 8 in Easton, Pa. A retired industrial engineer, he had been president of the Seward Wire Co and was founder of the Seward Distributing Co.

H. Alden Barnes, 57 vice president and general manager of the Wheeler Reflector Co, died on June 10 in Washington, D. C., on a business trip.

Helen Grove Bicknell, president of Porcelain Products, Inc, died on May 29.

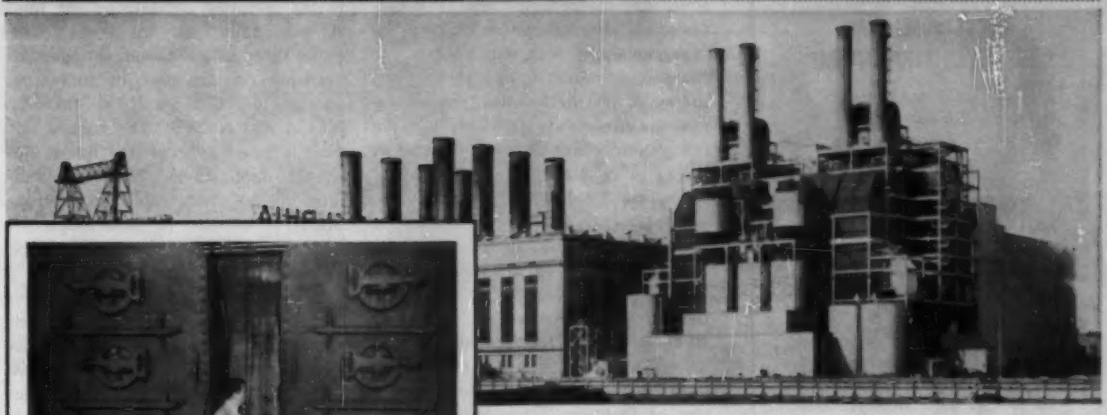
Julius L. Hecht, 74, retired vice president in charge of operations, Public Service Co of Northern Indiana, died June 8 in Chicago.

Karl M. Koch, 61, street lighting specialist for General Electric Co, died June 5 in Oakland, Calif. He had joined GE in 1912 . . . **Rear Admiral Walter A. Buck,** 60, United States Navy retired and vice president in charge of operating services for the Radio Corp of America died in Wynnewood, Pa., on June 12.

William N. Patten, formerly vice president of the Stone & Webster Engineering Corp, Boston, Mass., died in Salem, Mass., on June 8. He had been connected with S&W for 50 years before his retirement in 1949.

IDEAS FOR ENGINEERS

FROM C.H. Wheeler OF PHILADELPHIA



YEARS-AHEAD DESIGN IN STEAM CONDENSERS FOR UTILITIES THAT ARE EXPANDING

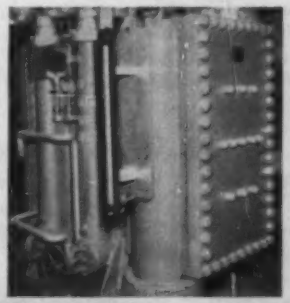
The Philadelphia Electric Company, for example, is one of the fastest growing utilities in the U. S. Here, men are thinking and working years ahead to take care of the "exploding" growth of the industrial Delaware Valley, and the ever-increasing population of Philadelphia, the "City of Homes". Nothing short of the most advanced design and efficiency of new equipment can be considered by the Philadelphia Electric Company to keep its generating capacity safely ahead of loading.

As part of their expansion program, two C. H. Wheeler 60,000 sq. ft. steam condensers are installed at the new Delaware Station. These are surface condensers of modern design; dual bank, single pass, divided water box type. Each unit condenses steam for a 125,000-kilowatt turbo-generator. Photo shows close-up of water box and manhole detail.

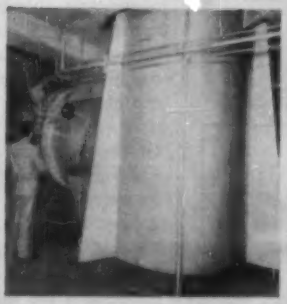
MAIN AIR EJECTORS ..by C. H. WHEELER

An important factor in the performance of the C. H. Wheeler Steam Condensers is the efficiency of the main air ejectors. C. H. Wheeler has always been the source for the latest developments in steam jet air ejectors.

The streamlined, steel-shell Tubejet Ejectors installed at the Delaware Station are effecting considerable savings in space and providing dependable removal of air.



HUGE C. H. WHEELER PUMPS DELIVER 86,500 GPM RIVER WATER



Other modern C. H. Wheeler installations at the new Delaware Station are the circulator pumps. C. H. Wheeler has closely integrated circulator pump design with modern steam generating demands. Pictured here is one of two vertical mixed flow circulating water pumps feeding Delaware River water to the new C. H. Wheeler Steam Condenser. Capacity of each pump is 86,500 GPM.

Bulletins mailed on request.

Inquiries receive prompt attention.

Representatives in principal cities.

C.H. Wheeler OF PHILADELPHIA

C. H. WHEELER MANUFACTURING CO., 19TH & LEHIGH, PHILA. 32, PENNA.

STEAM CONDENSERS · CENTRIFUGAL, AXIAL AND MIXED FLOW PUMPS · STEAM JET EJECTORS · VACUUM REFRIGERATION · HIGH VACUUM PROCESS EQUIPMENT
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Don't let today's tempo of coffee-break meals and low-vitamin snacks rob your organization of peak performance. Prescribe POWERCAPS for real "production insurance." More and more progressive companies are supplying vitamins to their employees as a dietary supplement.

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manufactured under your own label, cost little . . . just a pennies proposition . . . the biggest bargain in your employee welfare budget.

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Designed and manufactured to the exacting standards of the utilities industry

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MORRISTOWN, N. J.
Established 1930

1 md
52

. . . of the reason why there's only one basic reference in the electric power field is in your hands right now. Over 25,000 men like yourself find Electrical World helps them do a better job. Make the most of it!

Is AW Paying Off?

(*Continued from page* 114)

A: There's no cut-and-dried answer as to how adequate wiring can be sold, any more than there is a cut-and-dried formula which every salesman can apply with equal success to the sale of anything else. However, the successful home wiring sales programs already mentioned are proving one point, which nobody can deny: Selling adequate wiring is a job for the **specialty salesman.**

As I mentioned before, the public is awakening to the fact that its homes are underwired. But most laymen don't know where to go to "buy" home wiring. Therefore, when the specialty sales person is on the spot to crystallize Mr and Mrs Public's desire for improved wiring into a specific recommendation, accompanied by a firm estimate, in a majority of instances the sale is made without the application of any "magic."

Meanwhile, NECA is currently studying the question, through a pilot operation. The industry will look forward with interest to its findings on the most effective adequate wiring sales approach.

Q: You mention specialty selling, Mr Walker, what do you mean by that?
A: It means selling by people who are trained specifically to sell adequate wiring and who are trained and given a specific assignment. This has proved itself in the quad-cities area, St. Joseph, St. Louis, Chicago, and other localities.

A particularly good example of this is in Kansas City (page 112) where contractors teamed up and hired a man to do actual house to house selling. Individual contractors are recognizing the need for specialty selling of residential wiring.

Q: On the basis of your experience, what must a wiring program have to be successful?
A: Of course, successful programs have all been based on an organized approach backed by sufficient manpower and the money needed to get the job done. But, specifically, I would point to the following:

- Mutual respect of all branches of the industry for the objectives of each individual branch.
- A determination to conduct the program on a long-range basis with stated goals.
- An examination and evaluation of results with introduction of corrective action when needed.

Q: As you said earlier there is a growing consumer awareness of AW. How is the industry capitalizing on this?
A: Nationally, we are lending impetus through additional national advertising on the part of individual manufacturers as well as that by NECA and NAWB. The bureau this year is advertising in five home and shelter publications. NECA is running an ad every other week from March to October in Time magazine, and about 90% of these ads will be on adequate wiring.

Among manufacturers, Kennecott Copper Corp is continuing its consumer advertising in national publications, and so are Anaconda Wire & Cable Co, Allis-Chalmers Manufacturing Co, and Owens-Corning Fiberglas Corp.

Publicity reached a new high in its recognition by consumer magazines and press in 1954. 1955 has seen no slackening in interest. Look magazine indicated at the last Adequate Wiring Conference that it has planned another adequate wiring feature for this fall.

Bureau materials aimed at the consumer have reached new sales highs. During the first four months of 1955 they were 32% ahead of the same period of 1954—an indication that local programs are being aimed more directly at the consumer than ever before. Every large scale utility effort which has come to our attention this year has featured hard-hitting advertising campaigns. A widespread use of the Consolidated Edison Co film is a case in point. "The Magic Link" is available in utility areas representing over 90% of the residential meters in the country.

Q: Finally, Mr Walker, what are the bureau's future plans?
A: In the future—as in the past—the bureau will act as the industry's coordinating agency for national and local adequate wiring sales and promotional programs. It will continue to provide sales and promotional tools—information and assistance in the form of field service and through correspondence.

The specific form which the bureau's activities and materials take will, of course, be subject to deliberations of the Plan and Executive Committees.

POWER BRIEFS

● Geothermal Development, Ltd, has been established in New Zealand to develop atomic power and heavy water. The estimated $16.8-million development cost will be met by the United Kingdom Atomic Energy Authority and the New Zealand Government.

● Second 14,200-kw generator at Albeni Falls Dam on the Pend Oreille River in northwest Idaho is scheduled to begin operating July 1; third and last unit is set for Sept. 1 operation.

● Mississippi Power Co has begun work on a 100,000-hp generating plant between Gulfport and Biloxi, Miss. The plant, expected to be in operation by the summer of 1957, will increase the company's capacity by approximately 50%.

● Foundation work has begun on a new 137,500-kw addition to Pennsylvania Electric Co's Seward Generating Station on the Conemaugh River ten miles west of Johnstown. The project will cost an estimated $20,600,000.

● The Federal Power Commission has issued a two-year preliminary permit to Georgia Power Co for a proposed 65,000-hp project on the Chattahoochee River.

○ Columbus and Southern Ohio Electric Co have announced plans to build a new $34-million electric generating station on the east bank of the Muskingum river, opposite Conesville and seven miles south of Coshocton. Initially, a 125,000-kw unit will be installed. Proposed plant site is a 500-acre tract adjacent to company-owned coal deposits which will be used for fuel.

● Electric generating station, costing $8 million, has been planned by Southwestern Public Service Co, Amarillo, Texas. The plant site, about 12 miles west of Hobbs, N. M., covers 160 acres purchased from the state. The first unit will have a 96,000-hp capacity. Construction is scheduled to begin in the fall.

● The world's heaviest power cable has been strung across the Columbia River by the Bonneville Power Administration. The one-and-a-half-inch cable will feed one-million kw from Chief Joseph Dam to Puget Sound area.

● A 100,000-kw generator has been installed by Public Service Co of Colorado at its Arapahoe power plant in Denver.

World's tallest man-made structure
equipped with
PALNUT LOCK NUTS
Trademark

1,572 ft. television tower of station KWTV, Oklahoma City, designed and built by Dresser-Ideco Co., Columbus, O. has all nut-and-bolt assemblies locked with PALNUT Lock Nuts.

- Prevents loosening of nuts and bolts
- Eliminates checking and retightening

For up to 20 years, PALNUT Lock Nuts have been universally specified on AM, FM, TV and signal Corps towers, and extensively used on transmission towers and sub-station structures. Low in cost, easily applied and absolutely secure. Hot dip galvanized to exceed ASTM specifications. Specify PALNUTS for your towers. Samples on request.

The PALNUT Company
51 Cordier St., Irvington 11, N. J.

WHAT'S NEW? ●

We're interested . . . and so are Electrical World's readers! Are you all steamed up about your new product, new plant or expanded facilities? Got some red-hot new literature, research results or a new production method? Any financial, product design changes —shifts in executive personnel—consolidations? Whatever you have, *World* makes it easy to bring it to the reader's attention. Write for the booklet . . . *"How To Get Maximum Value Out of The News Releases You Write For Electrical World."*

MEETINGS CALENDAR

JUNE

AMERICAN NUCLEAR SOCIETY—1st Annual Meeting—Pennsylvania State University, State College, Pa., June 27-29.

CANADIAN ELECTRICAL ASSOCIATION—Annual Convention, Hotel Vancouver, Vancouver, B. C., June 27-29.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Summer General Meeting, New Ocean House, Swampscott, Mass., June 27-July 1.

INTERNATIONAL ELECTROTECHNICAL COMMISSION—London, England, June 28-July 9.

***ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM**—Mid-Atlantic Region Meeting, New York Athletic Club, Manhattan Room, New York, June 30.

JULY

AMERICAN MANAGEMENT ASSOCIATION—Summer Program Colgate University, Hamilton, N. Y., July 6-Aug. 31.

NATIONAL ASSOCIATION OF RAILROAD UTILITIES COMMISSIONERS—Executive Committee Meeting, LaSalle Hotel, Chicago, Ill., July 8.

NATIONAL HOUSEWARES AND HOME APPLIANCE MANUFACTURERS EXHIBITS—Atlantic City, N. J., July 11-15.

AUGUST

NATIONAL SHADE TREE CONFERENCE—31st Annual Convention, Mar Monte Hotel, Santa Barbara, California, Aug. 1-5.

SOUTHEASTERN ELECTRIC EXCHANGE—Personnel Administration Section, Roanoke Hotel, Roanoke, Va., Aug. 11-12.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Pacific General Meeting, Butte, Mont., Aug. 15-19.

STANFORD RESEARCH INSTITUTE—Symposium on Electronics in Automatic Production, Sheraton-Palace Hotel, San Francisco, August 22-23.

WEST COAST ELECTRONIC MANUFACTURERS' ASSOCIATION—1955 Wescon Show, Fairmont Hotel, San Francisco, August 24-26.

***SECOND WESTERN AREA DEVELOPMENT CONFERENCE**—sponsored jointly by Stanford Research Institute, the American Industrial Development Council and the Pacific Northwest Trade Association, Multnomah Hotel, Portland, Ore., Sept. 8-9.

SEPTEMBER

ROCKY MOUNT ELECTRICAL LEAGUE—Annual Fall Convention, Grand Teton Lodge, Jackson Hole, Wyo., Sept. 11-14.

***PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS**—37th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, West Va., Sept. 15-18.

***AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS**—2nd Electrical Conference of the Petroleum Industry, Shamrock Hotel, Houston, Tex., Sept. 12-14; Industrial Electronics Conference, Rackham Memorial Auditorium, Detroit, Sept. 28-29.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Cleveland, Sept. 12-16.

INSTRUMENT SOCIETY OF AMERICA—10th Annual Conference and Exhibit, Shrine Exposition Hall and Shrine Auditorium, Los Angeles, Sept. 12-16.

***EDISON ELECTRIC INSTITUTE**—Accounting Division Organization Meeting with American Gas Association, Netherlands Plaza Hotel, Cincinnati, Sept. 13-14; Industrial Relations Round Table Conference, Drake Hotel, Chicago, Sept. 19-21; Industrial Power & Heating Group, EEI Headquarters, New York, Sept. 22-23; Purchasing and Stores Committee, EEI Headquarters, New York, Sept. 26; Transmission and Distribution Committee, Jung Hotel, New Orleans, Sept. 29-30.

ASSOCIATION FOR COMPUTING MACHINERY—Annual Meeting, University of Pennsylvania, Sept. 14-16.

SYMPOSIUM OF ELECTRONIC AUTOMATION—University of Pennsylvania, Irvine Auditorium, Philadelphia, Sept. 19-20.

SOCIETY OF INDUSTRIAL PACKAGING AND MATERIALS ENGINEERS—10th Anniversary Meeting, Kingsbridge Armory, New York, Sept. 19-22.

PENNSYLVANIA ELECTRIC ASSOCIATION—Annual Meeting, Benjamin Franklin Hotel, Philadelphia, Sept. 20-21.

***SOUTHEASTERN ELECTRIC EXCHANGE**—Engineering & Operation Section, and Sub-committees, Charlotte Hotel, Charlotte, N. C., Sept. 22-23.

***NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS**—Pacific Zone, Annual Convention, Empress Hotel, Victoria, B. C., Sept. 25-28.

***STANDARDS ENGINEERS SOCIETY**—4th Annual Meeting, Hotel Statler, Hartford, Conn., Sept. 29-Oct. 1.

OCTOBER

***EDISON ELECTRIC INSTITUTE**—Meter & Service Committee, Hotel Syracuse, Syracuse, N. Y., Oct. 3-5; Prime Movers Committee, Hotel Cleveland, Cleveland, Ohio, Oct. 3-5; Electrical Equipment Committee, Shoreham Hotel, Washington, D. C., Oct. 17-18.

***ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM**—Workshop Conference, Chase-Park Plaza Hotels, St. Louis, Mo., Oct. 5-7.

***SOUTHEASTERN ELECTRIC EXCHANGE**—Accounting Conference, Hotel San Carlos, Pensacola, Fla., Oct. 20-21; Sales Conference, Biltmore Hotel, Atlanta, Ga., Oct. 27-28.

***NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS**—67th Annual Convention, Grove Park Inn, Asheville, N. C., Oct. 24-27.

***PENNSYLVANIA ELECTRIC ASSOCIATION**—Electrical Equipment Committee, Hotel New Yorker, N. Y., Oct. 27-28; Relay Committee, Pocono Manor Inn, Pocono Manor, Pa., Oct. 31-Nov. 1.

NOVEMBER

***EDISON ELECTRIC INSTITUTE**—Taxation Accounting Committee, sponsored jointly by American Gas Association, Plaza Terrace Hotel, Cincinnati, Ohio, Nov. 3; Accident Prevention Committee, Beaumont Hotel, Beaumont, Tex., Nov. 13-18.

***PACIFIC COAST ELECTRICAL ASSOCIATION**—Hawaiian Section Conference, Honolulu, Nov. 9-10.

***AMERICAN SOCIETY OF MECHANICAL ENGINEERS**—Diamond Jubilee, Congress, Hilton & Blackstone Hotels, Chicago, Nov. 13-18.

***WISCONSIN UTILITIES ASSOCIATION**—Electric & Gas Section, Schroeder Hotel, Milwaukee, Nov. 21-23.

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* Additions this week.

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you'll need a
new Power Plant
. . . then Pioneer Service & Engineering Co. with 53 years of experience in this specialized field, stands ready to help you with a complete service including preliminary plans, load studies and site selection, the design of the plant and arrangements for financing its cost.
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INFORMATION:

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

EMPLOYMENT ADVERTISING

New Employment Opportunities Section for Displayed ads starting July 11th issue.
For further details see announcement below.

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches —to a page. E. W.

SEND NEW ADVERTISEMENTS TO: 330 W. 42 St., N. Y. 36, N. Y., for July 11th issue closing June 30th

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1111 Wilshire Blvd. (17)

POSITIONS VACANT

Distribution Engineers—Two competent graduate electrical engineers, age 30 to 40, with minimum 8 years experience design, operation and maintenance of distribution of facilities, required by rapidly growing utility, desirable location South America. Portuguese or Spanish useful—not essential to start. Reply stating age, education, experience, personal particulars and minimum salary expected. P-6852, Electrical World.

Electrical Engineer—with at least 10 years' experience in power system stability problems. Requires thorough knowledge of electrical theory, symmetrical components, relay applications, and machine characteristics. Location—Midwest utility. Salary—open. Reply stating age, education, experience, personal data and minimum salary expected. P-6351, Electrical World.

Operations Assistant—Graduate Engineers, at least two years utility operating experience. To work under direction of vice president in analysis of property operations of diversified utility. Specific assignment—to improve operations and effect economies. Submit complete resume and starting salary. P-6566, Electrical World.

Architectural, Civil, electrical, mechanical, structural and traffic engineers are needed for expanding programs for either field or office assignments on a wide variety of municipal projects. Recent graduates start at $4613. Higher positions available depending on length and type of experience. For information write: Detroit Civil Service Commission, 612 City-County Building, Detroit 26, Michigan.

EMPLOYMENT SERVICES

Salaried Personnel, $3,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

Electrical Engineer, 25 years wide and varied experience in supervision engineering, and operation of utility Systems; steam, hydro, transmission and distribution. Desires responsible position with electric utility or industrial plant. Presently employed but desires change. PW-6493, Electrical World.

Electrical Engineer, age 33, BEE & MEE with strong technical background and experience in Power System relay application and installation and system performance. Presently employed in responsible position and seeking relocation. PW-6746, Electrical World.

21 years utility experience engineering and operation of gas, electric, steam systems. 48, married, family. Manager of engineering, operation, transportation. AIEE, NSPE, ASME. Registered. BSEE, Litt. M. degrees. Retired naval officer. Desire change. Prefer east, southeast. PW-6833, Electrical World.

Electrical Engineer, age 32, family, excellent health, BS in EE, PE, 5 years experience in distribution, transmission, and substation design, operation, and supervision. Currently employed in utility in the southwest but will locate anywhere in the U. S. Can supply excellent references. PW-6818, Electrical World.

POSITIONS WANTED

Electrical Engineer, B.E.E., 27 years experience in transmission and distribution operation, construction, and maintenance. 14 years as supervisor. Desire responsible position with electric utility or industrial plant. Registered professional. Member A.I.E.E. Location immaterial. PW-6786, Electrical World.

Young Elec. Eng.—single—4 years experience in Europe and United States—desires position in foreign country. PW-6784, Electrical World.

PERIODICALS

A.I.E.E. transactions back-volumes wanted to buy for cash. Ashley, 24 E. 21, N.Y.C. (10).

OFFICIAL PROPOSALS

Bids: July 12, 1955

Power Authority of the State of New York
Advertisement for Proposals for Alterations and Repairs to the Massena-Taylorville Transmission Line, New York

NOTICE TO CONTRACTORS: the POWER AUTHORITY OF THE STATE OF NEW YORK will receive sealed proposals for the Alterations and Repairs to the Massena-Taylorville Transmission Line, New York, in the following ways:

(1) If brought in person on the day of receiving bids, until 2:30 P.M. Eastern Daylight Saving Time on the 12th day of July, 1955, 270 Broadway, Hearing Room C on the 4th Floor New York, New York.

(2) If mailed in, until 2:15 A.M. Eastern Daylight Saving Time on the 12th day of July, 1955, at the Authority's office, 270 Broadway, Room 1300, New York 7, New York.

The proposal will be publicly opened and read aloud at the time and at the address given in (1) above.

Bids will be entertained for furnishing the equipment and services and performing the work in accordance with the bidding schedule. Completion of the work will be required on or before January 1, 1957.

Plans, specifications and Proposal Forms for the work will be on file in the Authority's office and in the offices of the Engineer, Uhl, Hall & Rich, 230 Congress Street, Boston 10, Massachusetts, may be inspected by prospective bidders during office hours, and may be obtained from the Power Authority of the State of New York, 270 Broadway, Room 1300, New York 7, New York, upon application and prepayment of a fee of ten ($10.00) dollars per initial set of contract drawings and five ($5.00) dollars per set for additional sets, no part of which will be refunded. Two sets must be returned with each bid.

Bids must be made in duplicate upon the Proposal Forms included in and bound with the Contract Documents. Each proposal must be accompanied by a draft or certified check payable to the order of the Power Authority of the State of New York for the sum of $50,000.00.

The right is reserved to reject any and all bids.

W. S. CHAPIN,
GENERAL MANAGER

Don't forget
THE BOX NUMBER

when answering the classified advertisements in this magazine. It's our only means of identifying the advertisement you are answering.

Attention . . .

EMPLOYMENT ADVERTISERS!

Effective with the July 11th issue, a new section will start in ELECTRICAL WORLD. We will head this section: EMPLOYMENT OPPORTUNITIES. All Displayed Employment Opportunity advertising will be placed in this new section, with the exception of those advertisers who contract for run-of-book position. Advertising in the EMPLOYMENT OPPORTUNITIES section will be billed at the new open rate of $19.15 per inch. Contract rates furnished on request. Ads are subject to Agency Commission.

For full information write:

ELECTRICAL WORLD
Classified Advertising
330 West 42nd Street, New York 36, N. Y.

What Is *Your* Problem?

Do you need competent men —men experienced in the industry served by this publication? Men to fill executive, sales or technical positions? OR—are you seeking employment in any of these capacities?

The 24,000 other readers of ELECTRICAL WORLD are the logical ones to contact for a solution to your problem. They are identified with the same industry and speak your "language." You can get their attention—at small cost—through an advertisement here.

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• Odd lengths—long and short—reasonably priced

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Let us quote on requirements—
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We'll also buy your Surplus
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FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL Wire and Cable Co.

2664M N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

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3—333 kva Kuhlman Transformers, 67,000 to 7620/13,200 Y Volts. Taps at 2½% above and below. Weight 5520 lbs. each. Price, $1,795.00 each f.o.b. Scott City, Kansas.

12—Allis-Chalmers Potential Transformers, Type P.W., 200 volt-amp., 14,400 to 120 volts—Guaranteed excellent condition—Price $110.00 each, f.o.b. Scott City, Kansas.

40—Jostyn Type J-9231-M, 9/13.8 Y KV. Removed from Allis-Chalmers Double Bushing Transformers. Excellent or new condition. Price $12.50 each, f.o.b. Scott City, Kansas.

36—Lightning arresters, Jostyn J-9231-E, 9/13.8 Y KV station expulsion. Excellent condition. Price $22.50 each, f.o.b. Scott City, Kansas.

For additional details call or write
THE WHEATLAND ELECTRIC COOPERATIVE, INC.
SCOTT CITY, KANSAS

This Searchlight Section

of ELECTRICAL WORLD

is an index of reliable sources for Used and Resale electrical equipment now available. Consult the *Searchlight Section* in following issues for later offerings.

If you don't see what you want—ask for it. Ask the advertisers. Dealers are constantly adding to their stocks and may have acquired just what you need.

And, when you have special items to dispose of, dealers will be glad to know of it, or you can use this Searchlight Section to contact user-buyers direct, if you prefer. Send a list of your equipment and we will gladly give full space and rate information.

Write

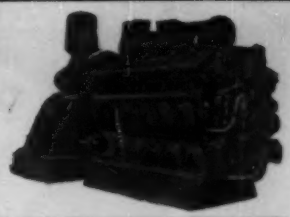
Classified Advertising Division

ELECTRICAL WORLD

330 W. 42nd St.
New York 36, N. Y.

DIESEL POWER

IMMEDIATE SHIPMENT
• PURCHASE OR RENTAL
UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
• ALSO D.C. UNITS



A PARTIAL LISTING OF OUR INVENTORY

KW	MAKE	Model	HP	RPM	KW	Make	Model	HP	RPM
1100	Worthington	SEH-6	1655	360	320	Superior	60E-6	480	450
1125	Fairbanks Morse	38D	1600	720	300	Fairbanks Morse	32E14	450	900
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
1000	General Motors	16-567B	1440	720	250	Clark	GD-4	375	865
750	General Motors	12-567	1080	720	200	General Motors	6-268A	330	900
700	Worthington	SEH-6	1000	327	175	General Motors	12-71	275	1800
675	Fairbanks Morse	38D	965	720	150	Buckeye	80	240	600
600	General Motors	8-567	720	720	148	Fairbanks Morse	32E14	220	900
500	Alco	6-12½13T	750	600	100	General Motors	3-268A	150	1200
350	Baldwin	VO-6	510	450	60	General Motors	6-71	90	1200
330	Enterprise	DSG-6	460	450					

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50-52 CHURCH ST., NEW YORK 7, N. Y.

TRANSFORMERS

FOR SALE

3—1000 Kva W-H 33000/34650-13200
3—1000 Kva Mol. 13200-2400/4160Y
6—1000 Kva Mol. 11500-2400/4160Y
3— 500 Kva G-E 22000-2300/4000Y
5— 333 Kva W-H 33000-7200/12470Y
3— 333 Kva G-E 33000-2300/4000Y/-8900/11850Y
3— 333 Kva G-E 33000-2300/4000Y
3— 333 Kva Wag 8900/11950Y/7200/-12470Y
3— 333 Kva Mol. 7200/12470Y-2400/4160Y
6—4200 Kva G-E 13200-2400/2300

Many other items in stock.

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Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
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40 Years' Dependable Service

Specialist for 47 Years in—

LARGE POWER EQUIPMENT

Do you receive our stock list? Prompt shipment from inventory. A.C. & D.C. Motors, Transformers, M-G Sets, Frequency Changers, Controls, Turbo-Generators and Circuit Breakers. Attractive prices for rebuilt-guaranteed equipment. Contact us before purchasing.

BELYEA COMPANY, INC.
51 Howell St. Jersey City 6, N. J.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR	VOLTAGE
3	1000	Mol.	110,000—460
1	10000	A.C.	66000—33000, 3 ph.
1	3750	West.	69000—14400 3ph.
4	2000	Mol.	66000—13200
4	750	G.E.	66000/11400—13200
1	500	West.	69000—4800
3	400	G.E.	66000/33000—2300/4160
3	200	Pitts.	66000—2300
3	100	Wag.	66000—2300
3	1250	A.C.	44000/11500—460
3	75	Est.	44000—7200/12470 Y
1	7500	A.C.	99038/69000 Y—13200, 3 ph.
3	1000	G.E.	38100/66000—4000
3	3750	Wmns.	38050/65865 Y—13800, 3 ph.
4	3333	G.E.	38100/66000 Y—33000
3	3125	Mol.	38900/66000 Y—33000/66000 Y
6	2000	Mol.	38100/66000 Y—13800
3	1333	G.E.	33000/11000—2400/7200
1	1000	G.E.	33000—4900/2300, 3 ph.
2	1000	Stand.	33000—4160, 3 ph.
1	1000	Kuhl.	33000—6900, 3 ph.
4	333	G.E.	34650—13800/23900 Y
3	200	A.C.	34600—2400/7200/12470 Y
3	75	Wag.	33000—240/480
2	3750	G.E.	26400—4360/2530, 3 ph.
3	1250	G.E.	24400/13200—2400
1	1500	A.C.	23400/44000 Y—6900/13000
4	833	G.E.	14400/24900 Y—2400/4160 Y
4	450	A.C.	23410/44000 Y—13200/23000
3	100	G.E.	23000—7200/12470 Y
3	667	A.C.	23000/13800 Y—2400/4160 Y
1	600	Stand.	13200—2300, 3 ph.
1	450	Penns.	13200—2400, 3 ph. ASKAREL
3	300	G.E.	13200—2400
4	200	G.E.	7200/12470 Y—2400/4160 Y
4	167	G.E.	7200/12470 Y—2400
3	125	A.C.	6900—2300
3	37½	G.E.	6900—230/460
4	150	G.E.	4800/2400—240/120
2	100	G.E.	4800/2400—240/480
3	333	G.E.	2400/4160 Y—460
3	250	G.E.	2300/4000 Y—115/230
3	200	West.	2400—240/480
3	150	West.	2400—230/115
1	100	G.E.	2300—575, 3 ph

ALSO:—FREQUENCY CHANGERS
MOTOR GENERATOR SETS
SYN. CONDENSERS
OIL CIRCUIT BREAKERS
FEEDER REGULATORS, ETC.

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TRANSFORMERS
NEW • REBUILT
WORLD'S LARGEST INVENTORY
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PHONE STATION COLLECT GL 6781
P.O. BOX [illegible] ROCHESTER, NEW YORK

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
EBASCO SERVICES INCORPORATED
APPARATUS EXCHANGE Two Rector St., New York 6, N. Y.

ASHTON B. COLLINS (3rd from l), SHOWN WITH AWARD WINNERS IN HIS REDDY KILOWATT ANNUAL REPORT CONTEST

Reddy Makes Report Award

New York State E&G 1954 annual report wins annual contest, four other companies awarded prizes at EEI's convention

New York State Electric & Gas Corp was the winner of the Reddy Kilowatt Annual Report Contest at the Edison Electric Institute's 23rd annual convention in Los Angeles.

The first prize was a bronze plaque. The Reddy Kilowatt contest is open to any investor-owned electric company, and the award is presented for the report best simplifying, dramatizing, and humanizing company operations. This year some 100 companies from all over the nation competed.

Judges Cite Reasons . . . The judges said the award was made to the New York utility for these reasons:

"The cover of the report splendidly dramatizes the varied applications of electricity to business and industry generally as well as in the home, on the farm, and to commercial establishments.

"For numerous pictures of the human interest type which nevertheless dramatize the business of the company in its service area; for good combination of charts and pictures illustrating the subject matter involved.

"The report dramatizes the use of funds for the business; shows a good chart on operating expenses; and illustrates sales activities.

"It has a splendid map of the system, a good table of contents, and an unusually good chart breaking down the revenue dollar.

"On page 18 there is a listing of the company's important industrial customers and an indication of the sources of the company's revenue.

"For the fine way the company describes its employee relations."

Other Winners . . . In the Class A group (400,000 or more customers) the winner was Pennsylvania Power & Light Co. Its report was picked for "its splendid color illustrations, the generally good physical production, its excellent typography, and its fine sales presentation of the economic role of the entire electric light and power industry."

Winner in Class B (200,000 to 400,000 customers) was Arkansas Power & Light Co. This report was chosen for its "brief summary and key message," its "simplified statements" dramatically presented, its "excellent illustrations," and for a good job "in using captions under the pictures to do a selling job on its various activities."

Interstate Power Co was the winner in Class C (100,000 to 200,000 customers). The report was commended for its "attractive and functional cover," its "excellent theme," for the "simplified and concise presentation of important facts."

In Class D (up to 100,000 customers), Nova Scotia Light & Power Co was the winner. The judges noted an "attractive cover," a "splendid theme," "good photographs," and excellent simplification.

Special Mentions . . . The judges gave special mention to Arizona Public Service Co for the originality and dramatization of its story in terms of a visit to the company by cartoon characters. Other special mentions went to Georgia Power Co for excellent pictorial presentation; and to American Gas & Electric Co for its outstanding service area map, among other things.

General Comments . . . The judges for this year's contest were: Fischer Black, publisher and editor, Electrical World; Merryle Rukeyser, economic analyst and writer; and Harold H. Young, partner, Eastman, Dillon & Co.

In general, commented the judges, the outstanding excellence of practically all the reports this year made judging a difficult task. They were pleased to see how many companies had followed the suggestion they made last year that utilities could well afford to dramatize their sales activities.

They commended companies for the increasing use of back covers which previously had been largely wasted; for originality in use of charts; and for the number of reports that featured public relations activities of the companies.

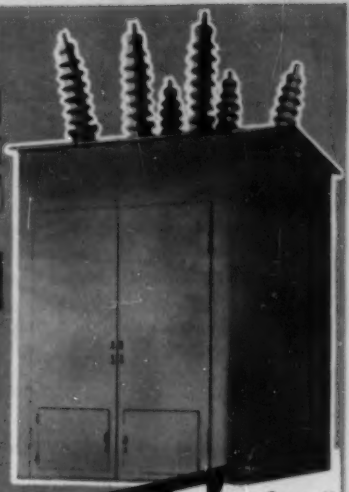
NOW!

A 2-CYCLE DISTRIBUTION BREAKER!

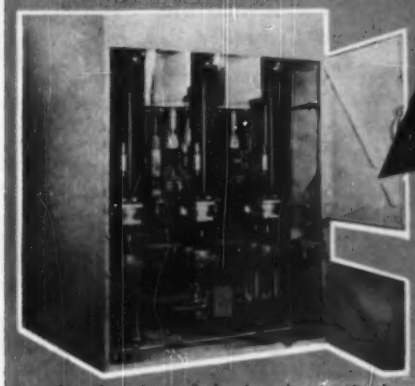
the new
Ultra-High-Speed

BROWN BOVERI **AIR BLAST BREAKERS**

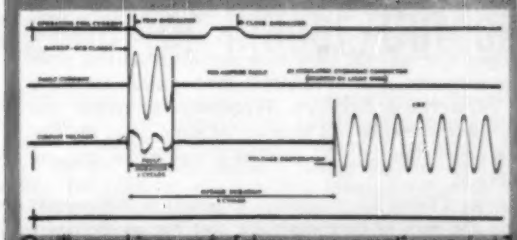
for 5, 7.5 and 15 kV Distribution Systems



Overall view of breaker housing. Floor space requirements are comparable to conventional breakers, terminal locations are equally convenient. 3 or 6 standard bushing type current transformers can be accommodated on underside of roof bushings. Relay panels can be placed inside the housing, accessible through separate doors without entering cubicle.



Interior view of the breaker in the housing. Note that both control mechanism and interrupters are easily accessible.



Oscillographic record of close-open operation against 7,000 amps at 5,000 volts with 7.2 kV 800 amps 150 mva Brown Boveri high speed Air Blast Breaker. The same unit was subjected to 27 consecutive close-open operations up to 10,000 amps after which, according to the testing utility, "only a small amount of burning was noticeable, and this only on surfaces that do not carry current."

HERE, at last is a super-fast breaker permitting more economical distribution system design.

The new, complete line of Brown Boveri ultra-high-speed air blast breakers in outdoor housings for 4.16, 7.2 and 13.8 or 14.4 kV (and higher if required) will handle currents up to 1,200 amps with interrupting ratings of 150, 250 and 500 mva at any of these voltages. These breakers have a *guaranteed speed of interruption* from the moment of energizing trip coils to fault interruption of NOT OVER 2 CYCLES over the full range of current from zero to full interrupting rating, and regardless of the character and power factor of the load.

These Brown Boveri Air Blast Breakers enjoy an exceptional service record because they require a minimum of maintenance and all essential components are easily accessible.

If you have been baffled by the lack of high speed breakers in your distribution system, it will pay you to investigate these 2-cycle Brown Boveri Air Blast Breakers.

Write for Data, today!

BROWN BOVERI CORPORATION

19 RECTOR STREET, NEW YORK 6, N. Y.

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Utilities Must Furnish Power, Promote Its Use

To the Editor:

It is certainly the duty of the power companies to maintain themselves as profitable undertakings; that is, they must strive to attain and hold a level of net earnings sufficient to attract capital investment.

It is also, and no less, their duty to furnish electricity and to promote its employment for any and all legitimate uses that the American people desire and can be persuaded to desire.

Slow Acceptance of Progress an Old Story

These two duties are not incompatible although it has happened more than once in the history of the industry that short-sighted men have acted as if they thought them to be. It was over 25 years after George Hughes raised his banner before the first million electric ranges were sold. The electric water heater traveled a long and rocky road to reach the comparatively modest acceptance it has today. The electric laundry dryer was regarded with shudders of horror when it was first introduced. And now comes comfort heating with electricity which is being accorded a grudging measure of toleration because it provides an offset to another load that is becoming an embarrassment.

In all of the instances above noted, there is to be seen a lack of enterprise that unfortunately has been and is yet typical of much of the thinking of power company managements. To my mind, the article "Cooling Load Needs Complement" in the May 9 issue is a prize example of such thinking. This opinion will be shared, I am sure, by many power company men when they read it. And that will be a counterbalancing fortunate thing for the industry.

In this article the author, Mr Bary, states that "only heat pumps offer" the possibility of an economical off-set to the summer cooling load. This may be true. Mr Bary has the figures to prove it. But is the service of electric house heating to be offered to the people only because, and to the extent that, it balances another load? Is that enterprise? Is it consonant with the duty of the power companies to extend and expand the amenities, conveniences, comforts, labor-saving, and safety of electrical living in the American home?

Users of Electricity Have Final Say

Before going further with this discussion of Mr Bary's article, I want to make it clear that I share his evident belief in the heat pump and its potentiality. Doing so, however, I recognize that resistance heating also has its place in the future of electrical living. And it is the users of electricity, not the suppliers of it, who have the choice of how they will employ electricity for house heating.

In a preceding paragraph, I said that Mr Bary had the figures to prove his contention of "only heat pumps." I do not question the accuracy of his figures, but I have grave doubt of their integrity as a base for the positive statements he makes.

In previous studies of electric house heating Mr Bary has used data from gas house heating installations, translating such figures into electrical quantities. This is perfectly proper if one assumes that the characteristics of the electric heating load are identical with those of the gas heating load. But such assumption blithely ignores the fact that electric and gas house heating are different breeds of cats. I do not know that the data in the present article are derived from gas heating experience. If they are, then it is a reason for doubting their validity.

Another reason for doubt lies in the fact that there has not yet been accumulated a sufficient body of load research data on the characteristics of electric house heating to justify any positive and all-inclusive statements about the load. Such data as are presently available are meager and are heavily weighted by the climatic and annually variable weather conditions in which they were obtained.

No Data Available on Controlled Heating

A third reason is that no one knows for certain what can be done in the way of controlling the electric heating load. There are indications that the load can be controlled so as to reduce the capital investment needed to serve it. With control the characteristics of the load may be greatly different from what they appear to be from present data. As yet no generally accepted conclusions have been arrived at on this point.

Altogether, it seems to me that Mr Bary has arrived at a verdict which convicts resistance heating on evidence insufficient, immaterial, and irrelevant.

Electric Service Worth Extra Cost

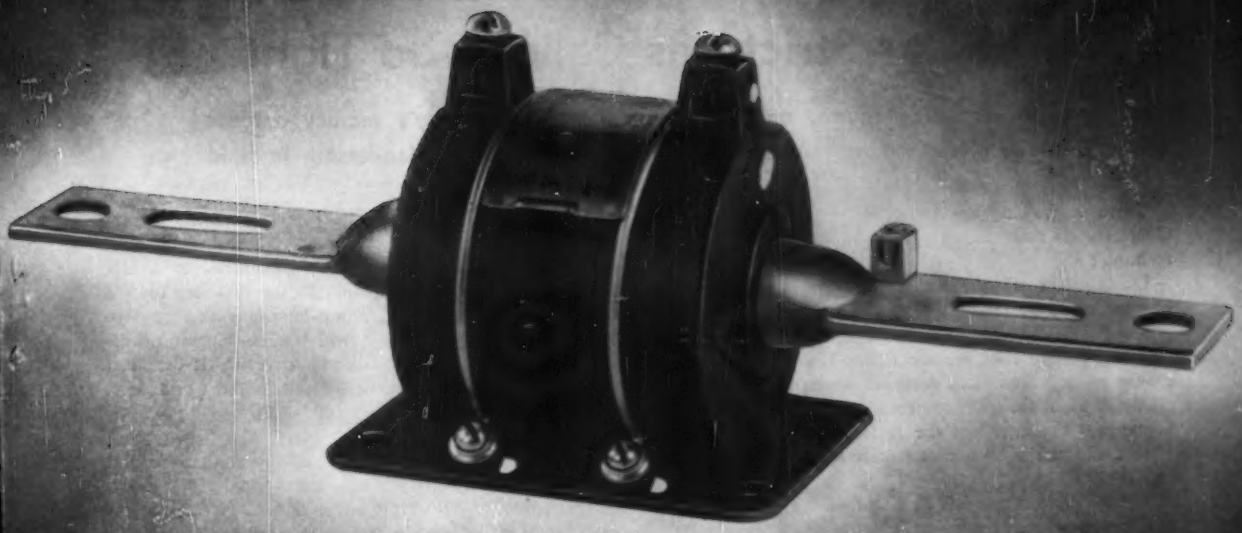
Permit me, please, a final word. With hedging phrases before and after, Mr Bary states in his article that "the cost of electric heating with resistors is too high to be competitive with the cost of heating with gas or oil." He and all others who take the same view should reflect that practically every service of electricity in the home has cost more than the service it displaced. Frequently the greater cost of the electric service has been ten or more times the cost of the other. Consider the costs of a vacuum cleaner and of a broom.

Electrical living has progressed so greatly in this country not on the basis of its competitive cost but on the desire of the people for it. And there are too many enemies of the power companies yammering about the cost of electricity for any power company man ever to refer to it as too high for any service.

Frank R. Innes

764 Scotland Road
South Orange, N. J.

Mr Innes is a retired associate editor of Electrical World. An ardent proponent of electrical living, he spent much of his last decade on the staff campaigning for acceptance of all new methods of applying electricity.



THE NEW G-E MINIATURE TRANSFORMER measures only 3½" long by 3$\frac{3}{16}$" wide by 4$\frac{1}{16}$" high without bar-primary, and weighs from 2 to 4¼ pounds. It is available in ratings of 200 and 400 amperes.

General Electric's Butyl-molded Miniature Current Transformer Designed for Indoor/Outdoor Use

General Electric's butyl-molded current transformer line has been extended to include a 600-volt miniature. The new Type JCA-0 features complete mounting flexibility. Designed for indoor or outdoor metering applications, the new miniature is available in 200- and 400-ampere ratings in both bar-primary and window-type construction.

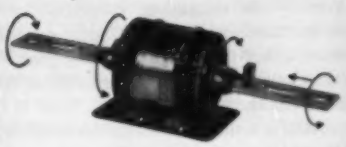
MOUNTING FLEXIBILITY is provided in the Type JCA-0 first by friction-fit primary terminals. These terminals are adjustable within a 360-degree arc and can also be moved lengthwise. Also the removable base plate can be rotated within an arc of 180-degrees in relation to the secondary terminals.

APPLICATION VERSATILITY is another outstanding feature of the Type JCA-0. Because of its butyl-molded construction, this new miniature transformer can be installed either indoors or outdoors, and requires no housing or other protection from the weather.

SIX VARIATIONS of this butyl-molded current transformer are possible. It can be used as a bar-primary-type or window-type, or with or without base plate and an auxiliary mounting plate.

FOR MORE INFORMATION, contact your nearest G-E Apparatus representative, or write for bulletin GEC-1245 to: Section 604-41, General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC



BAR-PRIMARY-TYPE

Complete adjustability is available in the new transformer. The primary and secondary terminals may be adjusted and set independently of each other. This flexibility provides mounting in any position.

WINDOW-TYPE

The new Type JCA-0 transformer is also available in a window-type construction for through-type applications. This feature plus the butyl-molded construction facilitates outdoor pole mounting installations.

WASHINGTON COMMENT

AEC Reactor Strictures Called Too Tight

Utilities, study teams, and politicians complain agency's secrecy defeats intent of revised Atomic Energy Act and hamstrings US leadership in field

There is growing discontent with the Atomic Energy Commission's reluctance to unlock all atomic power reactor technology.

Utilities and other firms associated with power reactor proposals and AEC study teams are joined by politicians and even AEC staffers in complaining that secrecy restrictions on reactor data are too tight. The law, they claim, makes possible complete declassification, but the AEC is trying to maintain strict control over their activities. They argue that the intent of the revised Atomic Energy Act is to make public all except strictly military data.

Dislikes Whole Approach . . . One of the chief critics of the program has been Sen Clinton P. Anderson (D.-N.M.), chairman of the Joint Committee on Atomic Energy. Anderson dislikes AEC's whole approach to the power reactor program. He claims AEC is resorting to subsidies for development so that it can continue to control businessmen by its awards of contracts, or signed agreements, rather than permitting an opening up of the whole development effort through a licensing plan. Anderson has indicated he's not through trying to break AEC's lock on reactor information.

AEC's limited-access-to-information program will face its acid test when the United Nations-sponsored International Conference on Atomic Energy takes place in Geneva August 8-20. Some experts think the Russians and their satellites at that meeting may divulge much reactor information still held under secrecy wraps in this country. State Department officials are turning pressure on AEC for release of more information to prevent us from being "scooped" in this fashion. If these efforts are successful, all civilian reactor technology would be declassified, and U.S. businessmen would be the biggest beneficiaries.

Technically, the Geneva conference is just a preliminary series of discussions to work out approaches to a UN atomic energy cooperation plan. It's the first step toward implementing Eisenhower's atoms-for-peace sharing program. Actually, however, it will be the biggest peacetime atomic forum ever held, and a wealth of technical information is expected to be handed to the world on a silver platter.

Possible Results . . . As a result of the conference and the subsequent setting up of an international UN agency, the US may enter into multilateral agreements with atom-hungry nations. These—and this is most controversial—may require American technical and material aid to be donated to the UN agency, with loss of all US control over the material thus loaned.

These agreements may be some time coming however. Meanwhile, this country has already initialed a score of bilateral agreements with have-not nations. Under their terms, we've agreed to supply fissionable materials and technical and financial aid to get foreign nuclear power programs off the ground. Retention of US control of loaned materials to a large extent is implicit in these agreements. Most of them have been negotiated, and Congress must act on them if they're to become effective.

What these international contracts will gain this country and American companies which have pioneered the industrial use of the atom is not yet known. But it seems clear enough that, eventually, they'll work to the advantage of US equipment suppliers and investors in foreign enterprises. To what extent is more or less up to the companies themselves.

TECHNICAL NOTES

Industrial system below 600 v and above 15 kv usually have solid-grounded neutrals; between these voltages resistance grounding is common.

Avoidance of scheduled feeder maintenance during the hot season permits a single transformer to serve air-conditioner motors of 500 hp or more at 460 v in network areas without affecting 120/208-v light and power service.

Linear capacitance of a transmission circuit in cgs electrostatic units is the reciprocal of the external linear inductance in cgs magnetic units.

Loss-of-field protection should automatically trip off a generator if malfunctioning of the generator can cause system instability.

Street lighting in Italy leans to fluorescent in smaller cities because their lighting needs are more pressing.

Aluminum conductors containing 0.5% each of magnesium and silicon approach sags of ACSR for rural lines.

Sparkover voltages of small gaps at moderate frequencies are essentially the same as for power frequencies. As gaps are lengthened, sparkover voltage becomes as much as 16% lower than power frequency values. Gap lengths are then roughly inversely proportional to frequency because ions are not cleared from the gap between cycles.

Line-drop compensators reflect capacitor switching in the output voltage of feeder regulators. Cutting out the resistance element restores conventional regulator action.

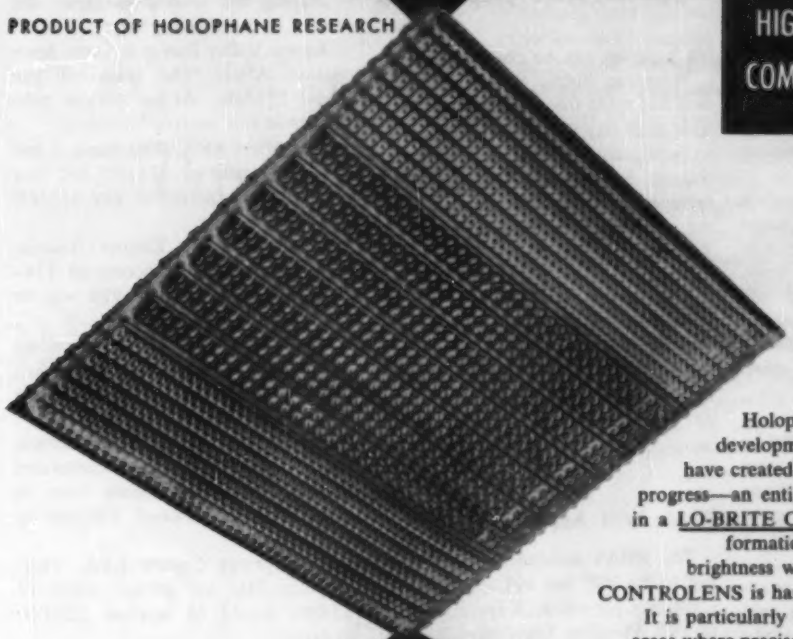
NEW 9026
by HOLOPHANE

PRODUCT OF HOLOPHANE RESEARCH

GREATER VISIBILITY

HIGHER COMFORT

EXTRA EFFICIENCY



LO-BRITE* CONTROLENS*

Holophane engineers, pioneers in the development of lenses for illumination, have created another contribution to lighting progress—an entirely new prismatic construction in a LO-BRITE CONTROLENS . . . The unusual formation of the prisms provides lowest brightness with highest visual comfort. This CONTROLENS is hand pressed by skilled craftsmen. It is particularly adaptable to modern low-ceiling areas where precise control of light is so important; also highly effective for continuous runs . . . It is recommended for a wide variety of locations: offices, showrooms, stores, schools, libraries, laboratories and other modern installations . . . Write us for a list of lighting manufacturers who use the LO-BRITE CONTROLENS as part of their equipment.

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BE SPECIFIC . . .

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2% REA Gross Sales Tax

. . . is proposed by legislative committee of Wyoming State Rural Electrification Assn instead of suggested state property tax

Legislative committee of the Wyoming State Rural Electrification Association is proposing a 2% tax on Rural Electrification Administration gross sales in place of state property taxes on the REA's.

Wyoming REA's had been exempt from state property taxes until action by the legislature last February subjected them to state property taxes. The co-ops contend the action will drive them out of business. They are mapping an appeal to Gov Milward Simpson and the legislature for relief.

REA's Study Tax Plan

The legislative committee headed by Lawrence Lorenzen of the Tri-County Electric Association, Sundance, Wyo., has suggested the 2% tax on gross sales. The committee's proposal is being studied by the REA's.

J. Harold Cash of Kaycee, president of the state REA association, said he expected the association to ratify the committee's proposal. It will then be presented to Gov Simpson and the legislature, when it convenes, possibly in a special session this fall. The next regular session is January, 1956.

"We are willing to pay taxes, but not at a rate that is confiscatory," Cash declared.

REA's Can't Survive

After an emergency meeting of REA officials in Casper recently, the association said in a statement:

"It is very apparent that hardly any of the rural electric co-operative in Wyoming can survive under the tax as proposed. Without requesting discrimination, we believe a distinction must be made in the valuations of electric lines on the basis of revenue produced.

"Rural lines producing little revenue cannot be expected to carry tax load equal to urban lines. We believe strictly rural distribution systems should be valued at not more than 25% of the valuation proposed.

"This consideration would give only a minimum of temporary and immediate relief until a more equitable program can be considered."

Wyoming Public Service Commission has ruled that this year co-operatives must pay taxes on the same basis as public utilities. REA officers claim this is discriminatory because they serve sparsely populated areas while the utilities sell power to urban areas. The 15 REA's in Wyoming serve approximately 22,000 farms and ranches.

"We average about 1½ consumers per mile of line, yet we will pay the same tax on that mile that the Mountain States Power Co pays on a mile of line in downtown Casper that serves a thousand consumers," Cash said.

REA's Will Appeal

The REA's decided against a protest to the PSC but will appeal to the legislature for relief. A special session of the Wyoming Legislature may be called later this year to consider other matters.

Several of the co-ops said they could not pay the tax this year because it had not been anticipated in budgets adopted last year. Under legislation adopted in 1949, Wyoming REA's had been exempt from state property taxes. They had expected a six-year extension of the exemption but the renewal legislation was defeated 13-12 in the Senate after being approved unanimously in the House. It died along with exemptions proposed for war veterans and homesteaders.

Cash said on a state-wide basis the property tax would run about 4.5% of the co-operatives' total valuation.

Among the specific examples discussed at the meeting were:

Lower Valley Power & Light Association, Afton: "Our taxes will run about $29,000. At our present rates we could not survive."

Wheatland REA, Wheatland: It had a capital credit of $11,000 last year and will be expected to pay $12,000 in taxes this year.

Riverton Valley Electric Association, Riverton: Had income of $14,000 over expenses in 1954 will be assessed $18,000 in taxes.

Tri-County Electric Association, Sundance: Has an accumulated deficit of $179,000 will be assessed between $30,000 and $40,000 in taxes.

Niobrara Electric Association, Lusk: Has a five-year accumulated deficit of $130,000, broke even in 1954, will be assessed $20,000 in taxes.

Hot Springs County REA, Thermopolis: Has an annual deficit of $5,000, would be assessed $20,000 in taxes.

Cash and other REA officials said they could meet their present tax obligations only by increasing rates. They said this would decrease the use of electricity and discourage co-operatives from expanding service to remote areas.

"There are still some 2,000 farmsteads in Wyoming not serviced by electricity," said Cash. "If this tax schedule stands, they never will be," Cash added.

(*Financial Briefs on page* 272)

Public Offerings—Electric Utility Securities
(Thousands of Dollars)

	First Quarter of 1955			First Quarter of 1954		
	New Money	Other	Total	New Money	Other	Total
Bonds, Notes, and Debentures	210,204	72,796	283,000	412,850(a)	40,000	452,850
Preferred Stocks	30,867	9,817	40,684	46,630	.....	46,630
Common Stocks (b)	102,553	.....	102,553	125,383	.....	125,383
Total (b)	343,624	82,613	426,237	584,863	40,000	624,863

Notes: (a) Includes $60 million Commonwealth Edison Co's Gas Divisional Lien bonds, now Northern Illinois Gas bonds, and (b) Does not include sales of stock acquired in exchange for stock of another company.

Pipes of Progress

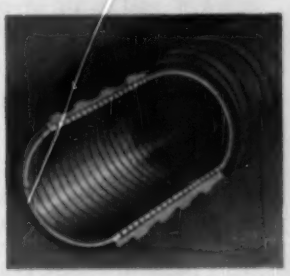
Hundreds of thousands of telephone conversations or hundreds of television programs may one day travel together from city to city through round waveguides—hollow pipes—pioneered at Bell Telephone Laboratories.

Round waveguides offer tremendous possibilities in the endless search for new ways to send many voices great distances, simultaneously, and at low cost. Today, Bell Laboratories developments such as radio relay, coaxial cable and multivoice wire circuits are ample for America's needs. But tomorrow's demands may well call for the even greater capacity of round waveguides.

Unlike wires or coaxial, these pipes have the unique property of *diminishing* power losses as frequencies rise. This means that higher frequencies can be used. As the frequency band widens, it makes room for many more voices and television programs. And the voices will be true, the pictures faithfully transmitted.

These studies illustrate once more how Bell Telephone Laboratories scientists look ahead. They make sure that America's telephone service will *always* meet America's needs, at the lowest possible cost.

Testing round waveguides at Bell Telephone Laboratories, Holmdel, New Jersey. Unlike coaxial cable, waveguides have no central conductor. Theoretically, voice-capacity is much greater than in coaxial cable.



New type of waveguide pipe formed of tightly wound insulated wire transmits better around corners than solid-wall pipes.

New type waveguide is bent on wooden forms for study of effect of curvature on transmission. The waveguide itself is here covered with a protective coating.

Bell Telephone Laboratories

Improving America's telephone service provides careers for creative men in scientific and technical fields.

FINANCIAL BRIEFS

Merrill Lynch, Pierce, Fenner & Beane has sold a secondary offering of 23,971 shares of common stock of Houston Lighting & Power Co at $40.875 a share . . . **Consolidated Edison Co of New York** plans to sell around $50 million of bonds sometime this year . . . **Arkansas Power & Light Co** has sold its headquarters building in Little Rock to Union Life Insurance Co of Little Rock for $375,000. AP&L will continue to occupy the building until its plans for a new office building take shape. Last year the company had bought a new office building site. A company spokesman said that plans for the new building were not yet complete.

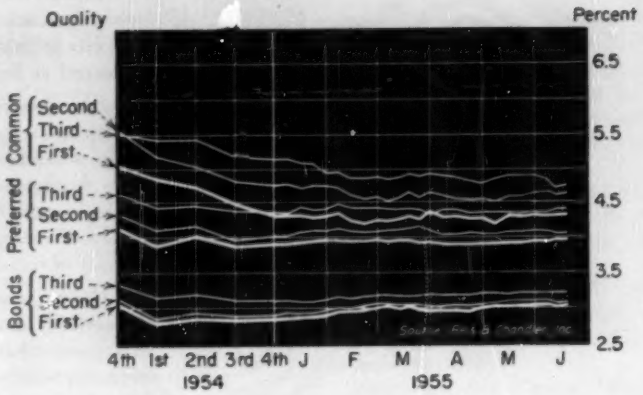
Shelter Island Light & Power Co is planning to sell some common stock soon . . . **Central Power & Light Co** has asked Securities and Exchange Commission approval to sell its ice properties to Southern Texas Ice & Service, Inc, for $1.1 million in cash on or before Jan. 16, 1956, or $1.2 million if paid partly in cash and partly in debt securities of Southern Texas Ice & Service.

Wisconsin Power & Light Co common stockholders subscribed to 195,624 common shares out of 263,140 shares offered on a 1-for-10 basis at $25 a share; balance was taken by Smith, Barney & Co, and Robert W. Baird & Co group, underwriters. Company's preferred holders took 21,093 shares of 4.40% preferred stock out of 30,000 shares offered on the basis of any amount desired at $102.75 to yield 4.28%; balance was purchased by the above underwriting group.

Houston Lighting & Power Co is planning to sell $25-$30 million bonds later this year or early next year . . . **Western Light & Telephone Co** has sold privately $2.5 million of first mortgage bonds 3½% due 1985 . . . Blyth & Co is offering a secondary issue of 20,000 common shares of **Cleveland Electric Illuminating Co** at $36.875 a share.

British Columbia Electric Co has sold $15 million first mortgage bonds 3¾% due in 1980 to a syndicate headed by Nesbitt, Thomson & Co. The underwriters offered the bonds to the public at 99.50% to yield 3.78%.

Today's Utility Yields—(%)



QUALITY	BONDS			PREFERRED STOCKS			COMMON STOCKS		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
June 16	3.04	3.08	3.21	3.96	4.08	4.39	4.31	4.58	4.75
June 9	3.03	3.08	3.21	3.96	4.06	4.26	4.33	4.61	4.74

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Central Maine Power	12	May	$6,475,132	$5,300,031	$2.03	$1.73
Central Power & Light	12	April	6,600,340	6,390,837	....	....
Minnesota Power & Light	12	May	3,631,344	3,782,201	1.78	1.87
Missouri Public Service	12	April	1,547,985	1,543,978	0.84(a)	0.88(a)
Oklahoma Gas & Electric	12	May	7,713,285	5,837,263	2.17	1.81
			1954	1953		
Brazilian Traction, Light & Power	12	Dec.	$19,849,015	$20,986,914	$....	$....
Sacramento Municipal Utility District	12	Dec.	3,268,311	2,686,654	....	....

Notes—Figures shown for last two companies have been audited; (a) After giving effect to a 3-for-1 stock split.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
JUNE 16-22			
BONDS			
Oklahoma Gas & Electric—1st mtg 3¼% due 1985	$15,000	100.959%	3.20%
SCHEDULED FOR JUNE—JULY—AUGUST			BID DATE
BONDS			
Gulf States Utilities—bonds or debs	$10,000	.....	.....
PREFERRED STOCK			
Idaho Power—15,000 sh $100 par 4%	$1,500	$100.00	4.00%(a)
Consumers Power—100,000 sh	10,000	.....	July 21(b)
COMMON STOCKS			
Long Island Lighting—624,170 sh (to be offered commonholders on 1-for-10 basis, record July 1 to expire July 18; additional 33,543 sh to be offered to employees)	.....	.....	.....
Consumers Power—373,689 sh (to be offered commonholders on 1-for-20 basis, record July 21 to expire Aug. 5; unsubscribed stock will be offered to employees)	.....	.....	.....

Notes—(a) To be offered by Wegener & Daly Corp, underwriters around June 28; (b) Morgan Stanley & Co group, underwriters.

STATISTICS

Manufacturing Use of Energy

(all figures millions of kwh)

	1953	1952	1951	1950	1947
All industries	216,898	200,986	194,826	177,504	140,947
Food & kindred products	12,396	13,198	12,920	12,634	10,180
Tobacco manufactures	320	295	276	253	219
Textile manufactures	13,166	13,277	12,849	12,478	10,041
Apparel & related products	na	1,759	1,669	1,664	850
Lumber & products (except furniture)	4,994	4,829	4,338	4,011	2,338
Furniture & Fixtures	1,297	1,225	1,229	966	826
Paper & allied products	21,578	20,670	20,290	19,165	15,386
Printing & publishing industries	na	2,773	2,530	1,751	1,280
Chemicals & allied products	33,961	30,272	29,204	25,958	19,610
Petroleum & coal products	9,424	9,109	8,713	8,045	6,498
Rubber products	3,858	3,828	3,866	3,777	3,445
Leather & leather products	740	740	702	674	573
Stone, clay & glass products	10,526	10,980	11,045	9,938	7,898
Primary metal industries	61,711	54,493	54,497	50,111	40,645
Fabricated metal products	6,685	5,640	5,713	4,919	3,901
Machinery (except electrical)	9,236	8,399	8,114	6,491	5,921
Electrical machinery	6,060	5,622	5,091	4,565	3,616
Transportation equipment	11,885	10,144	8,675	7,655	6,061
Instruments & related products	1,095	1,018	915	806	545
Miscellaneous manufactures	na	2,715	2,190	1,643	1,114

The top 3 consumers used 54% of all energy used by manufacturing in 1953

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Apr.	105.30	104.93	93.56	12.5
Peak—Class I Systems (million kw)	Apr.	82.4	83.4	73.7	11.8
Estimated Dec. '55 Peak	Mar.	96.5	96.4	96.0	0.6
Production—billion kwhr	Mar.	44.45	40.23	38.92	14.2
hydro		10.40	8.57	9.92	4.8
fuel		34.05	31.66	29.00	17.4
Sales—billion kwhr	Mar.	39.94	38.99	34.43	16.0
residential		11.08	11.57	9.88	12.2
commercial		6.20	6.20	5.68	9.1
industrial—includes sales to AEC		20.36	19.11	16.76	21.5
other		2.29	2.11	2.12	7.9
Fuel Consumption	Mar.				
coal—million tons		11.51	11.09	9.89	16.4
oil—million barrels		6.81	7.43	6.46	5.5
gas—billion cu ft		83.41	63.63	78.23	6.6
Net Income Class A & B Co's—$ million	Mar.	107.80	121.07	94.39	14.2
Residential Customers—millions	12 mos.	43.44	43.35	42.15	3.1
revenue per kwhr	ended	2.68¢	2.68¢	2.72¢	−1.5
avg. kwhr per customer	Mar.	2,606	2,587	2,400	8.6
avg. annual bill		$69.84	$69.33	$65.28	7.0

Business Statistics . . .

Indexes: 1947-49 = 100					
FRB Industrial Production	May	137	138	124	10.5
ENR Construction Cost	May	137.0	135.7	129.7	5.6
BLS Cost-of-Living	Apr.	114.2	114.3	114.6	−0.3
NEMA Sales	Apr.				
insulation materials		160	160	124	29.0
electric appliances		105	126	97	8.2
household refrigerators		96	106	73	31.5
Wholesale prices	May				
motors and generators		120.8	120.5	124.1	−2.7
transformers and regulators		127.3	127.3	128.1	−0.6
switchgear and fuses		135.6	135.5	135.1	0.4
GNP—annual rate—$ billion	1st Qtr.	$370.0	$362.0	$355.8	4.0

FACT: Corrosive atmosphere can't harm *Lifetime* meters

Corrosion can steal years of performance from your watthour meters . . . skyrocket maintenance costs. That's why Westinghouse gave its new Lifetime meters and sockets a corrosion-proof design which defies polluted atmosphere, salt vapor, heat, cold, dirt and moisture.

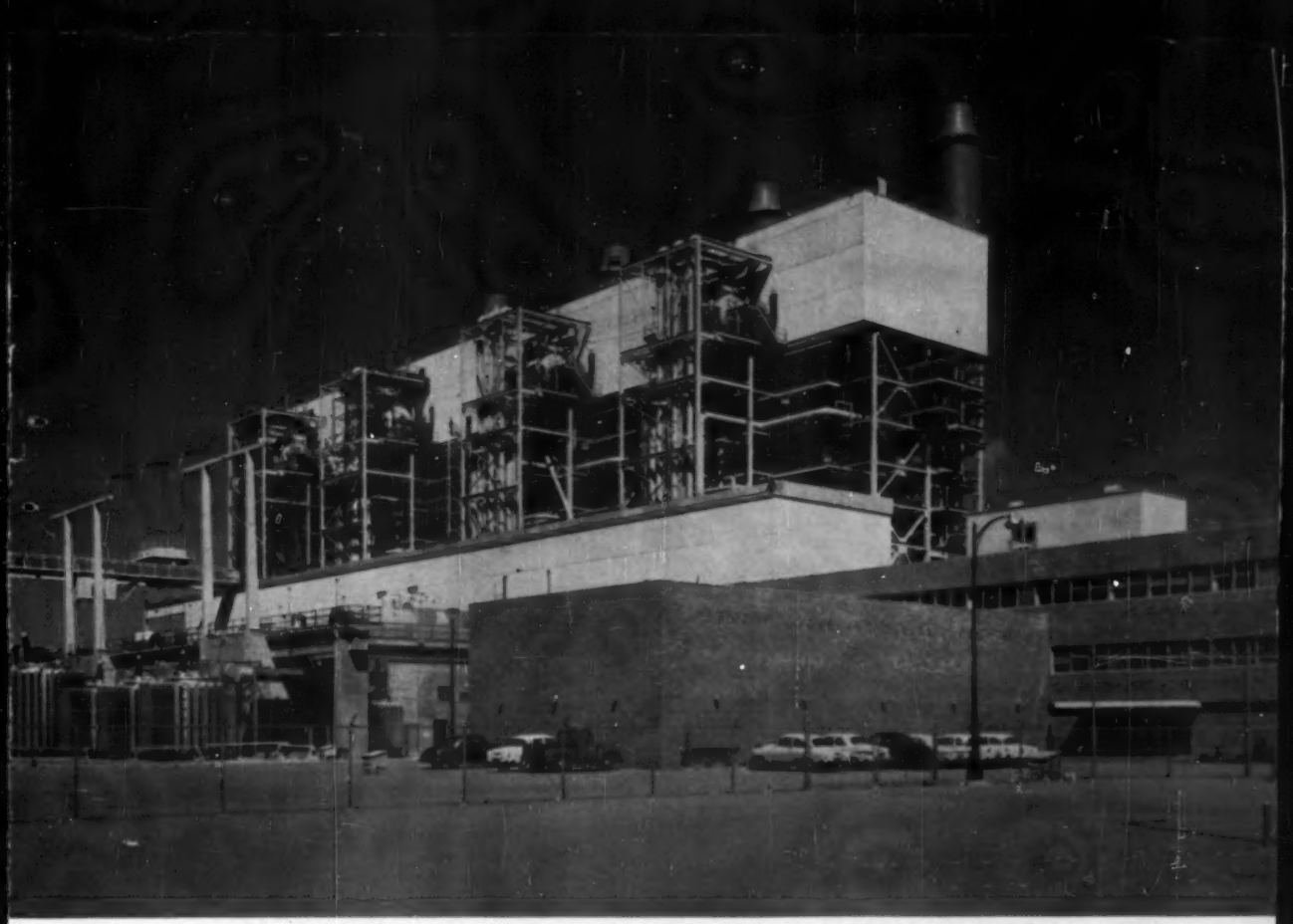
Aluminum, plastic, lacquer and enamel are used in conjunction with metal parts to help combat corrosion. All metal parts get protective treatments to keep them working smoothly, dependably.

For example, shafts and gears are gold finished. A chemical process is used to create a corrosion-resistant film on aluminum parts. This film actually becomes part of the metal, won't rub off or chip. Result: Westinghouse Lifetime meters run better, longer with less attention. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40482

New Lifetime watthour meters

Type DA bottom-connected, type DS socket construction.

YOU CAN BE SURE...IF IT'S Westinghouse



Ultra-modern plant! The Pacific Gas and Electric Company has recently put into operation the steam electric plant pictured here—the West's largest! Closed-circuit television and other advanced features have been incorporated into this mammoth Pittsburg, Calif., power plant.

For positive operation of switchgear...

the West's largest steam plant uses Exide®-Manchex® Batteries!

Exide-Manchex batteries with time-proven performance, control the switchgear equipment in the largest steam electric plant ever built west of the Mississippi. Whenever Exides are used positive switchgear performance helps to assure service continuity.

EXIDE-MANCHEX FEATURES:

Dependable power which assures instant operation of circuit breakers

Large reserve of power for all control circuits and emergency lighting

State of charge easily determined by simple hydrometer reading

No electrolyte change during entire life of battery

Low cost maintenance—water needed only twice a year

Large capacity in small space

Exceptionally long life . . . low cost for owning and operating

These are the performance and operating features of the Exide-Manchex battery which make it your best power buy—AT ANY PRICE.

Get more details! Bulletin 210 has complete data on Exides used for switchgear control, emergency light and power. Write for your copy today—no obligation. Contact your nearby Exide branch office for complete battery engineering service.

Exide-Manchex Batteries, like those relied upon at the new Pittsburg, Calif., plant of the Pacific Gas and Electric Company, are also used by electric utilities all over the country. Exide-Manchex batteries are your best switchgear power buy—AT ANY PRICE!

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.